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ABSTRACT

Designed to be self-contained, the material in this workbook on social indicators can be used for teaching and research purposes by agency field workers and/or undergraduates from developing nations who do not have a social science background. Originally presented to 22 professional people from Bangladesh, Indonesia, and the Philippines as part of a 10-week workshop on research methods for rural development held at the East-West Center in Honolulu, Hawaii (November 1975), this material includes many illustrative tables (e.g., Proposed Indicators of Overall Philippine Well-Being; Criteria of Social Well-Being and Variables Used in Analysis of 48 United States; Preliminary Cross-Cultural Scale for Measuring Level of Living; Comparison of Level of Living Scores for Georgia, Puerto Rico, and the Dominican Republic; Sample Household Food Consumption Schedule; Mauritius: Food Balance Sheet, 1960-64; etc.). Since data indicate food is virtually all that rural poor people in developing nations have and since most social indicator measures are more appropriate for urban dwellers in developed countries, especially the more affluent, it is suggested that food be made the core measure at the family, village, and national level. It is further suggested that food is inherently distributive (even the rich can only eat so much) and that as an indicator of human welfare, food avoids the problem of value judgments upon the relative quality of life provided by a given technological innovation. (JC)

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SOCIAL INDICATORS FOR DEVELOPING COUNTRIES: A NEW APPROACH

by

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PREFACE

The material presented in this handbook on social indicators was originally presented as part of a ten-week workshop on research methods for Technology and Development at the East-West Center in November, 1975. The workshop was part of the Institute's project on the Role of Intermediate Institutions in Technology Transfer to Small Farmers. The participants included 22 professional people from Bangladesh, Indonesia and the Philippines. A few of these were sociologists, but most came from a variety of other professional fields. All worked on problems of rural development. In the workshop the participants were given reprints of much of the material included in the bibliography so that they would have a self-contained mini-reference library when they returned to their universities and agencies where such material would not be available. The aim was to provide enough material for non-sociologists to do a simple piece of research on one or more measures of the quality of life. A new approach is suggested that makes food a core measure at the family, village and the national level. Food is virtually all that poor rural people in developing countries have or spend money on. Yet most measures used in social indicator research are more appropriate for urban people in developed countries, and especially the more affluent among them.

The hope in revising the material presented at the workshop into the handbook was to make such material available to a wider audience with similar research needs. It is meant to be self-contained and many illustrative tables are included to make it so. But it can easily be expanded by using the bibliographic sources. It can be used for teaching and research purposes for persons in agencies carrying on field work and research who do not have a social science background and for undergraduates in developing countries. It does not, of course, include instructional material on statistics or on research design, both of which are readily available in standard sources.

I wish to thank Bruce Koppel for suggesting that I do this piece of work and I thank him and Gary Hansen for making it possible. I thank the workshop participants for their patience, support, questions and reactions to the material; such help is essential in preparing teaching material. I thank Laura Felix, Gloria Yu, Helen Honma and Francine Hirokawa for typing and processing materials. I also thank my husband and colleague, Frank W. Young for his customary criticism, advice and support.

THE SOCIAL INDICATORS MOVEMENT

In the 1960s the social indicators movement in the United States gained momentum. During the administration of Lyndon Johnson there was a growing feeling of wanting to go around or beyond purely economic approaches to national development and to set goals, make efforts and evaluate progress directly in terms of how well people--and especially poor people--actually live rather than in narrower terms of market indicators, GNP, and cost-of-living indices. The idea was not that economic indicators could be dispensed with, but that national goals should not be merely economic nor should economic progress be accepted as a sufficient definition of national progress. People became concerned about pockets of poor people living in the midst of the richest nation in the world, about national health statistics where infant mortality fell far behind that of less affluent nations, of problems of deprived ethnic groups, of school systems that were not educating people, of growing problems of pollution and of use of national resources. The movement had two edges: first, defining national goals in terms of human welfare rather than purely economic progress; secondly, measuring national welfare in terms of human welfare rather than in terms of strictly economic indicators. The two are of course related, and the aim of measurement was to provide a set of social welfare indicators that would be used to evaluate programs, assess change, and guide policy. The aim was to develop social indicators to monitor social change that would be as standardized, as widely understood, used and accepted as the economic indicators that have so long fed into government policy.

Similar concerns have arisen in the developing countries and in international agencies--the U.N. and the World Bank (World Bank 1975). Their concern with the measurement of social welfare had similar origins. Western economic theories had guided programs designed by the developed nations to help the developing since World War II. These substantial efforts did not appear to have had the desired effect. If one examined particular programs carefully some seemed to have totally failed. Others may have succeeded as planned in terms of doing what they set out to do--such as provide electrification--without having had the desired effect, such as stimulating industry or raising the level of living. Still others could not be evaluated at all. In fact, development programs are notoriously difficult to evaluate. Designs and measures for doing so are lacking. This apparent lack of congruence between development efforts and development outcomes has stimulated social scientists, international agencies and national governments to go in the direction of a more direct but broader criterion of development, namely are the people any better off than before we started. Thus these agencies, as in the case of the United States groups, have begun to set goals in terms of human welfare. Currently popular terms that summarize this point of view are such phrases as integrated rural development, the lowest 40 percent, etc. Agencies are specifying the use of funds for projects that can demonstrably alter human welfare, not indirectly by helping large industry in the assumption that its expansion will have indirect or trickle-down benefits for the poor, but helping those projects where the poor are built in directly and in the visible future. These revised views of development and dissatisfactions with traditional economic views have also led to a realization of the need for better measures and more precisely defined goals. For example, national development agencies are trying to work on social indicators for their own countries, and international agencies have social indicator groups or departments.[1]

There is also, of course, an economic version of this. Some economists are now concerned with "income inequality." That is they are interested not only in the size of the GNP and its increase, but in how it is distributed. But other social scientists still feel that this is a narrowly conceived approach that focuses on political and social problems only insofar as they relate to purely economic concerns, and that many social and political structures affect well-being directly and have to be dealt with and altered in their own right. If income is poorly distributed, this means that opportunity is also, along with political access, social status, educational opportunity, self-determination, and access to information. It means that policies about use of resources and government goals are also narrowly conceived. Thus they feel that there is a theoretical need to broaden the problem from income inequality to human welfare, social justice, and political participation.

Sheldon[2] and Parke (1975) have described the course of the development of the social indicators movement and distinguish several different types of research efforts that have developed from these first rather vague beginnings. One is the provision of statistical time series that measure changes taking place in society. Another is evaluation of social programs and development experiments. A third is modifying previous methods of national accounting to provide improved measures of national welfare. A fourth they mention include efforts to define national goals and priorities and measure costs of achieving them.

In terms of what researchers might actually do social indicators research includes: describing the social system; studying change and trends over time; evaluating programs, giving policy advice based on these kinds of research. All of these quite general activities have a focus on social welfare or the quality of life, vaguely defined but definitely going beyond an economic definition.

So far so good. But what is welfare? All that we know so far is that economic definitions are not good enough. The social indicators movement has been called a social movement because that is a more appropriate term for it in its present state than any other, such as theory, model, paradigm, etc. It is strong on conviction, widely accepted and undefined.

Definitions have run largely to lists of what a social scientist or government agency consider good indicators of social welfare. These are chosen on a value, normative or idealistic basis, but tend to include many of the same types of elements: diet and food, health, education, housing, public safety. Sometimes they include social problems, political participation, use of resources, pollution, the quality of government. One such list is an attempt by the Development Academy of the Philippines to set social goals and recommend measures of them in "Measuring the Quality of Life: Philippine Social Indicators" (1975). Another list comes from David Smith's study, the Geography of Social Well-being in the United States (1973). These are very similar and are based on common sense or human understanding. They agree quite well on what they think social well-being is, but they have not defined it conceptually or derived it from any kind of theory. We might say, however, that these lists (and others like them) constitute a range definition of social welfare. (See Tables 1 and 2.)

The only efforts to reduce these lists of normatively chosen social welfare indicators have been empirical. There have been a number of cross-national comparisons in which factor analyses were performed on numbers of social indicators and many such indicators are reduced to a smaller number of dimensions. A similar cross-state comparison was made by David Smith's study. He reduced the list of state indicators to a small number of dimensions. The first he called socioeconomic well-being. Items that correlate highly with this dimension are measures of affluence and poverty, infant mortality, diet, housing measures, employment, health services, educational services and others. He found a second component, social pathology, and various indicators of crime, venereal disease and the like correlated highly with this dimension. Many such studies have found high correlations among various types of social welfare indicators, and these lead us to believe that there is at least a general affluence-poverty dimension that includes many health, nutrition, housing, education and other indicators along with poverty and more strictly economic measures.

A NEW EMPIRICAL APPROACH TO THE MEASUREMENT OF SOCIAL WELFARE

A new approach to the problem of measurement of social welfare is needed that is particularly well-suited to developing countries. Without attempting to discuss it in detail here, I will give a brief overview of such an approach. I am going to suggest first that measurement of food supplies be used to stand for social welfare. Measurement of food supplies has often been made at the household level through household food consumption surveys. In a number of studies that have been conducted, the level of food consumption has been shown to be related to other measures of family welfare.

Food supplies have also been measured at the national level through the food balance sheet. This instrument used all manner of data on agricultural production collected by departments of agriculture, data on exports and imports and pulled it together to estimate national food supplies. These relate to other national measures such as the GNP. Information compiled in this way has been shown at least in some cases to be close to estimates made in carefully conducted household surveys.

The household level of analysis and the national level are used in many studies. An intermediate level of analysis has received relatively less attention even though it is this intermediate level of the market town, the village, the municipality, county or state that is very important for national planning and for the evaluation of development programs and projects. The possibilities of measuring food availability at the intermediate level will be emphasized in this review and the links between the family, intermediate and national levels explored.

Agricultural economists have conducted studies of the whole marketing system of an area or a city including shops, markets, street vendors and all kinds of retail outlets. They have monitored food supplies coming into and going out of an area by stopping trucks

Table 1. Criteria of Social Well-being, and Variables Used in Analysis of 48 United States

Criteria and Variables	Direction
I. INCOME, WEALTH AND EMPLOYMENT	
i. Income and Wealth	
1. Per capita annual income ($) 1968	+
2. Families with annual income less the $3000 (%) 1959	-
3. Total bank deposits per capita ($) 1968	+
ii. Employment Status	
4. Public assistance recipients (% population) 1964	-
5. Union members per 1000 non-agricultural employees 1966	+
6. White-collar employees (% of total) 1960	+
iii. Income Supplements	
7. Average monthly benefit for retired workers ($) 1968	+
8. Average monthly AFDC payments per family ($) 1968	+
9. Average monthly aid to the disabled ($) 1968	+
10. Average monthly old age assistance ($) 1968	+
11. Average weekly state unemployment benefit ($) 1968	+
II. THE ENVIRONMENT	
i. Housing	
12. Median value of owner-occupied houses ($) 1960	+
13. Houses dilapidated or lacking complete plumbing (%) 1960	-
14. Index of home equipment (max. = 600) 1960	+
III. HEALTH	
i. Physical Health	
15. Households with poor diets (%) 1965	-
16. Infant deaths per 10,000 live births 1967	-
17. Tuberculosis deaths per million population 1967	-
18. Hospital expenses per patient day ($) 1965	+
ii. Access to Medical Care	
19. Hospital beds per 10,000 population 1967	+
20. Physicians per 10,000 population 1967	+
21. Dentists per 10,000 population 1967	+
22. Persons covered by hospital health insurance (%) 1965	+
iii. Mental Health	
23. Residents in mental hospitals, etc., per 100,000 population, 1966	-
24. Patient days in mental hospitals per 1000 population 1965	-
25. Mental hospital expenditures per patient day ($) 1965	+
IV. EDUCATION	
i. Achievement	
26. illiterates per 1000 population 1960	-
27. Draftees failing armed service mental test (%) 1968	-
ii. Duration	
28. Median school years completed (x 10) 1960	+
29. Persons attended college per 1000 population aged 25 or over, 1960	+
iii. Level of Service	
30. Pupils per teacher 1968	-
31. Public school expenditures per pupil ($) 1967	+
V. SOCIAL DISORGANIZATION	
i. Personal Pathologies	
32. Alcoholics per 10,000 adults, 1970	-
33. Narcotics addicts per 10,000 population 1970	-
34. Gonorrhea cases per 100,000 population 1970	-
35. Syphilis cases per million population 1970	-
36. Suicides per million population 1967	-

Table 1-Continued

Criteria and Variables	Direction
ii. Family Breakdown	
37. Divorces 1966 per 1000 marriages 1968	-
38. Husband and wife households (% of total) 1966	+
iii. Crime and Safety	
39. Crimes of violence per 100,000 population 1969	-
40. Crimes against property per 10,000 population 1969	-
41. Motor vehicle accident deaths per million pop. 1967	-
VI. ALIENATION AND PARTICIPATION	
i. Democratic Participation	
42. Eligible voters voting (%) 1964	+
43. Registered voters per 100 population of voting age 1968	+
ii. Criminal Justice	
44. Jail inmates not convicted (%) 1970	-
45. Population per lawyer 1966	-
iii. Racial Segregation	
46. Negroes in schools at least 95% negro 1968	-
47. City residential segregation index (max. = 100) 1960	-

NOTE: Direction of measures--a plus sign means that high values are "good" and low are "bad"; a minus sign means the reverse.

SOURCE: David M. Smith: "The Geography of Social Well-being in the United States" (New York: McGraw Hill Book Co.), pp. 82-83.

Table 2. Proposed Indicators of Overall Philippine Well-Being

Recommended Indicators	Recommended Frequency
Health and Nutrition	
1. Infant mortality rate	annual
2. Expectation of life at birth	quinquennial
3. Days disabled due to illness per capita per year in disability days equivalent, by membership in the labor force, and by family status (Experimental)	annual
3.1. Proportion of persons who are ill (prevalence), by degree of disability and by occupation	semestral
3.2. Proportion of persons who became ill during the period (incidence), by type of disease and by occupation	semestral
4. Available supply of calories per capita per day	annual
4.1. Proportion of children under 7 who are underweight, by degree of undernourishment	annual
5. Available supply of proteins per capita per day, by origin (animal or vegetable)	annual
Learning	
6. School enrollment ratio, per level of schooling (primary, secondary, tertiary)	annual
7. Value of human capital stock created by schooling (Experimental)	annual
7.1. Ratio of mean educational capital in the most educated quintile to mean educational capital in the least educated quintile	annual
Income and Consumption	
8. Net Beneficial Product per capita (Experimental)	annual
9. Proportion and number of families below the food poverty threshold (Experimental)	annual
9.1. Proportion and number of families below the total poverty threshold (Experimental)	annual
10. Ratio of mean income of richest quintile to mean income of poorest quintile	annual
11. Rate of inflation of consumer prices	monthly
Employment	
12. Unemployment rate of the totally unemployed, by occupation and by educational attainment	quarterly
12.1. Underemployment rate, in totally unemployed equivalent, by occupation and by educational attainment	quarterly
13. Real wage rate index, skilled vs. unskilled workers, by occupation	monthly
Non-Human Productive Resources	
14. Reproducible capital stock	annual
15. Arable land	annual
15.1. Concentration ratio of agricultural land ownership	annual
16. Forested land	annual
17. Mineral reserves, by type of mineral	annual
Housing, Utilities, and The Environment	
18. Proportion of occupied dwelling units adequately served with water	biennial
18.1. Proportion of the population served by electricity at home	annual
19. Index of housing adequacy (Experimental)	annual
19.1. Proportion of households with 1.5 persons or less per room	annual
19.2. Proportion of occupied dwelling units made of strong materials	annual
19.3. Proportion of occupied dwelling units with toilets	annual
20. Air pollution index for Greater Manila (Experimental)	quarterly
20.1. Pollution concentration levels, by type of pollutant, by station	quarterly
21. Proportion of river-lengths polluted by river, by degree of pollution	biennial

Table 2-Continued

Recommended Indicators	Recommended Frequency
Public Safety and Justice	
22. Crime incidence rate, by type of crime	monthly
22.1. Index of citizens' perception of public safety and justice (Experimental)	annual
23. Backlog of judicial cases	annual
23.1. Ratio of judicial cases disposed to total cases needing disposition, by court of jurisdiction	annual
24. Number admitted to penal institutions	annual
24.1. Number confined in penal institutions	annual
Political Values	
25. Ratio of votes cast to registered voters	every election
25.1. Ratio of votes cast to registered voters to population aged 21 and over	every election
26. Index of political mobility (Experimental)	biennial
27. Index of political participation (Experimental)	biennial
27.1. Index of political awareness (Experimental)	biennial
27.2. Index of freedom of political dissent (Experimental)	biennial
28. Index of political efficacy (Experimental)	biennial
Social Mobility	
29. Index of occupational mobility (gross mobility) (Experimental)	quinquennial
29.1 Coefficient of openness of occupations (circulation mobility) (Experimental)	quinquennial
30. Index of perceived social mobility (Experimental)	quinquennial

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SOURCE: Development Academy of the Philippines: "Measuring the Quality of Life: Philippine Social Indicators," 1975, p. 5-7.

on all the egress and ingress routes. Obviously such a method of assessing food supplies could be used for monitoring regional welfare of all of the states or counties of a country over time. It would yield information on absolute supplies, on change, and trends and on regional problems, imbalances, and special shortages. Such assessments ought to relate well to information gained in household surveys and national food balance sheets.

Without discussing them in detail here, I will propose what I think are the advantages of focusing on food supplies to measure social welfare.

1. Food is a fundamental need basic to people in all countries.

2. People's nutritional habits do not change as much as many other phenomena that could be used to measure welfare over time. Technology rare at one point in time is possessed by everyone at a second point in time or has become obsolete. Food does not become obsolete.

3. Similarly, people in one area may have a different material culture than people in another area, but both peoples will have similar nutritional needs. Differences in taste may exist. One group may use rice, another wheat. But we know how much rice is equivalent to what quantity of wheat nutritionally and can more readily compare substitutes of food than of housing, technology, education or other things that differ more because of availability of resources and cultural influences. That is, food is less cultural specific.

4. Food is inherently distributive. A rich person in one of the large cities of the world eats much more proportionally than poor rural people. But even he can consume only so much and we can study the differences more precisely than we can with material objects or money. The rich, urbanite can still eat only so much, but he can possess billions of dollars. There is no limit on the degree to which material or monetary wealth can be concentrated, but there is a relatively low limit on the amount of food any one person can eat. Therefore, allowing for well-known facts such as that American eat a great deal of grain indirectly in the form of beef, we can assume that the more food available, the better most people eat. The deviations from the even distribution of food can be readily studied at the household level.

5. The capacity to buy food measures the economic capacity of the individual better than many other important welfare indicators. Health facilities and programs have to be organized at a governmental level. Hospitals and vaccination programs are not good indicators of individual economic capacity because they can be available to otherwise poor people through goverament programs. The same is true of education and many other things.

6. Food is better than any other variable for measuring the welfare of the very poor because it is just about all that many people have or spend money on. Nonetheless, we often want to monitor change or differences among these very poor long before they reach a stage where they can buy household objects or have much cash income.

7. For similar reasons, it is a best overall indicator for use with rural people. It overcomes difficulties of assessing cash income and income in kind or of equating household or farm technology over time or in non-comparable areas.

8. Food can be studied and assessed together with the food utilizing, producing, processing and distributing institutions at the household level, the village or state level, and at the national level and the whole process of getting at and distributing it can be studied from level to level in such a way as to reveal national distribution processes and government and social processes as no other indicator might do. So many other factors enter into health than health institutions it is not amenable to this treatment. Money can be studied with great difficulty at the intermediate level and the meaning of a certain amount of money changes from group to group, place to place and time to time in ways difficult to assess.

9. Food is related to other indicators of social welfare at the household level, the intermediate level, and the national level and thus can stand for a wide range of more particularistic measures that can be used in any one group or region or at a particular time.

10. Food as an indicator of human welfare avoids, as much as anything can, the problem of value judgments, of deciding whether a given technological innovation really does improve life. Anthropologists often quite legitimately raise the question of whether a change from the traditional way of life to a modern technology really

improves health and welfare. By focusing on improvement of diet or lack of it, we are provided with at least one thing that can be evaluated in the same terms of nutritional adequacy in both contexts.

The diagram in Figure 1 shows units of analysis at three social system levels of the household, the village-district, and the national level. It has two columns, one indicating food-based measures of social welfare, and the other showing a range of measures that are related to the food indicators. I am suggesting that food can stand for a wide range of the measures of social welfare that are based on services, roles and possessions, and that it can do so at all three levels. I am also suggesting that there are close relations between aggregated measures of food at the household level, at the village level, and the national level. With this larger scheme in mind, we will begin with the household level of analysis and look at two established methods of research: the household level of living scale first and then the household food consumption survey. It will be clear that these two types of measures are related.

LEVEL OF LIVING

In the 1940s rural sociologists in the United States were faced with the same problem now facing those working in less-developed countries, namely how to measure the affluence or well-being of rural people much of whose income was not in cash. Rural farm people presented a particular problem. They earned money by raising cash crops, but they also raised a good deal of what they ate and this represented a substantial part of their income. In addition they did not keep good accounts of what cash income they did have, so they were really not sure what their cash income really was.

By 1940, twenty-five years of change had taken place in rural areas of the United States. An organized attempt to better the lives of rural people had been launched by President Theodore Roosevelt who organized the Rural Country Life Commission in 1912. From this came the United States Agricultural Extension Service, the Land Grant Colleges, Departments of Rural Sociology and Agricultural Economics. There followed a period of improving agriculture, of trying to build roads, provide electrification to rural areas, improve rural institutions. Schools were centralized, volunteer fire companies organized, and there was research on all kinds of rural institutions--churches, clubs, communities. In the wake of these efforts toward rural development, came the need to evaluate them. There were two questions: First, did life improve for rural people? Second, which rural people improved; which accepted new farm practices, participated in rural institutions, became educated, and the like?

These are the same general questions to which the social indicator movement addresses itself today. In the 1940s researchers realized that cash income represented only part of rural farm income. More than this, cash income was only part of what the Rural Country Life movement aimed at improving. From the beginning it was interested in rural life in its broader aspects.

The instrument developed in the '40s by William Sewell and Stuart Chapin and used for many years for evaluation was the Level of Living Scale. It was based on an assessment of household objects. It sometimes included other aspects of family life, such as education and social participation in community organizations. When it did not include these, it often used information about education, occupation, and income to validate the scales, and it correlated them with social participation. Thus it assessed more than material possessions. What it measured might be termed style of life. Social class is probably not a good label for the reason that some of the groups were not comparable. How do you decide whether a farmer is higher or lower class than various village occupational groups? They live and spend their money differently and participate in different social groups. Furthermore, farmers differ widely among themselves in level of living.

A researcher trying to develop a level of living scale first compiles a list of all kinds of household objects and furnishings commonly used in the area where he is developing the scale. He tries to include objects owned only by the very rich, but also includes a range of objects that even the poor own, objects that all but the very poorest own. Sometimes this list also includes types of house constructions, building materials used, whether there are floors, numbers of rooms, type of roof, windows, etc. It may include type of sanitation and access to water. It may also include type of lighting, type of fuel, cooking equipment, transportation (automobile, bicycle, etc.). The aim is to cull this large pool of items and find a smaller number that do the best job of measuring the level of living. There are two general methods of selecting items. These are described in detail in the article by Sharp & Ramsey (1963). One consists of giving every household a score of one for each item it has and zero for each item it does not have. These scores are added up, and the group is split into two groups, half assigned to an upper

Figure 1

	Measures Based on Food	Other Related Measures of Social Welfare
Family Level	Food variety Quantity	Household objects Housing quality Health Services Education Occupation Income, etc. Transportation
Intermediate Level (Village, County, etc.)	Food supplies in retail trade system (shops, markets, vendors) Food produced Food imported and exported from area	Village or County differentiation
National Level	National food balance sheet	G.N.P. Infant mortality, Literacy, Housing, Public Health Services, Sanitation, Employment, etc.

group and half to a lower. (These groups are assumed to have known differences of level of living and are used as a criterion.) Then each item in the item pool is related to the criterion variable--in this case Sharp & Ramsey used chi square--to see which items do the best job of discriminating the two criterion groups. They used thirteen items from an original pool of forty-nine. These are shown in Table 3.

The other method of validating items is to relate each item to an outside criterion, such as education, Table 4, or occupation, Table 5 (assuming these are not included in the item pool). Sharp & Ramsey (1963) found that either of the methods produced very similar results. Scales compiled by these different methods were very highly correlated; the correlations ranged from r = .71 to .92.

When the pool of items is reduced to a smaller number that are judged to be best measures, this reduced number of items is used to give each family a score based on possession or non-possession.

The advantages of this method are apparent. It is a simple measure with an empirical basis. It does not depend on knowing how much income a family has, nor of finding cash equivalents for income in kind. It does not depend on the researcher's value judgments of what an affluent family ought to buy. And above all, it is worked out for each local group and therefore is peculiarly appropriate to that group at that time.

Its deficiencies follow from these same characteristics. Because it is calibrated to a particular local group at a particular time, it is not applicable, by definition, to another group, or even to the same group five or ten years hence. Sewell found that his scale developed in rural Okalahoma was not usable twelve years later for the same people. Items that discriminate the rich from the poor at one period will not do so later; in ten years time everyone may have an item only the rich could previously afford. Or an item may be made obsolete within a short time when it is replaced by some new invention. This is an age of rapid technological change, and this is especially true in rapidly developing areas, where we most want to do research.

Another problem follows from these same characteristics: items that discriminate well in one group do not do so in another. Items are difficult to find that discriminate well, for example, in Georgia, Puerto Rico, and the Dominican Republic (Table 6 and 7). Another example is drawn from a study by Ramsey and Collazo. Tables 8 and 9 taken from this study show level of living scales developed for Broome County, New York and for Puerto Rico. The authors set themselves the task of finding a set of items from these that could form a single scale usable in both places. Their solution was to find a set of items that were correlated with occupational status in each culture and use them in a single scale, even though as Table 10 shows, many items on this reduced list were possessed by over 90 percent of the people in Broome County New York. Even within the same country the same scale will not do for Georgia and New York State; for urban people and rural people; or even for rural farm people and rural non-farm people. These groups represent distinct styles of life and people in them spend their money differently. The same item will not have the same meaning to the different groups.

The problems for which we would like to use level of living measures in developing areas today are just those for which this type of measure presents problems. For example, we want to know if a new factory in an area, or a new irrigation system, has improved the welfare of the people. Using the level of living scale, we would have two different scales: one for before the change devised in a baseline study, and one for say ten years after the change. It would yield certain information such as that now everyone has electricity, before few or none did. Now everyone has a can opener; before no one did. We would be able to see the general pattern of change in household technology. But we would not be able to get information as to which people improved the most. Nor would we be able to say how much they have improved. One cannot say life has improved 20 percent because someone has a can opener or an electric light. Nor would cash income provide a much better answer, even supposing it were possible to measure it (and it rarely is). How do you compare a person who has changed from farm to factory work? His needs are different, prices are different, and goods for sale are different. Do these changes constitute an improvement in social welfare?

It would be especially difficult to compare two regions with this scale. Suppose we want to know if the people in a region that has a new factory have a higher level of living than an adjacent region that has no factory and where the people are still all farmers. Such a comparison is impossible, because people in the two regions of a similar level of affluence will have quite different styles of life and quite different material culture and household objects. This may be the most common research question in developing countries and one for which this method is singularly inappropriate.

Table 3. Items Included in the Internal Criterion Scale and Chi Squares of Relationships to Selection Criterion New York State Level of Living Scale

Item	Percent of families possessing scorable item	Chi square*
Heating system	67.6	117.53
Water supply	78.0	137.17
Sewage disposal system	60.8	74.35
Sweeper	83.2	91.07
Lawn mower	44.7	116.38
Basement	57.9	56.98
Garage	61.7	72.18
Condition of lawn	63.8	95.98
Living room floor finish	33.8	86.0[illegible]
Condition of living room suite	31.5	96.65
Ottoman	58.7	76.09
Doorbell	22.8	67.51
Number of magazines taken	54.8	58.82

*All of the chi square values shown are significant at one percent level of probability.

SOURCE: See Table 5.

Table 4. Items Included in Education Scale and Chi Squares of Relationships to Selection Criterion New York State Level of Living Scale

Item	Percent of families possessing scorable item	Chi square*
Heating system	67.6	11.54
Water supply	78.0	21.21
Sewage disposal system	60.8	11.78
Record player	59.0	27.00
Clothes dryer	11.6	9.80
Pressure cooker	51.1	22.91
Kitchen range	92.1	9.44
Sleeper	83.2	11.78
Condition of lawn	63.8	16.70
Condition of living room suite	31.5	15.20
Bookcase	46.2	11.56
Doorbell	22.8	10.60
Number of magazines taken	54.8	9.88

*All of the chi square values shown are significant at one percent level of probability.

SOURCE: See Table 5.

Table 5. Items Included in Occupation Scale and Chi Squares of Relationships to Selection Criterion New York State Level of Living Scale

Item	Percent of families possessing scorable item	Chi square*
Heating system	67.6	29.16
Bathroom	38.0	20.22
Adult recreation room	7.2	27.61
Power lawn mower	44.7	15.10
Kitchen of automobile	71.8	14.51
Age of automobile	21.0	25.55
Basement	57.9	16.53
Picture window	20.5	15.17
Living room floor finish	33.8	27.22
Condition of living room suite	31.5	31.82
Living room curtains	61.9	16.70
Ottoman	58.7	15.19
Doorbell	22.8	16.99

*All of the chi square values shown are significant at one percent level of probability.

SOURCE: Emmit F. Sharp and Charles E. Ramsey: "Criteria of Item Selection in Level of Living Scales," Rural Sociology, Vol. 28, No. 2, June 1963, pp. 150-152.

Table 6. Preliminary Cross-cultural Scale for Measuring Level of Living

Function 1.	Shelter: construction of exterior walls	Score
	Brick, concrete block masonry, painted frame	5
	Asbestos or asphalt siding	4
	Unpainted frame	3
	Scrap wood, Coca-cola signs	2
	Grass, leaves, none	1
Function 2.	Shelter: construction of living room floor	
	Finished hardwood, tile, terrazo	5
	Finished or painted softwood, bare concrete	4
	Unfinished hardwoods or softwood with tongue and groove	3
	Wood with cracks	2
	Earth	1
Function 3.	Shelter: construction of roof	
	Concrete, tile, good shingles	5
	Corrugated or sheet metal, warped shingles	4
	Roll roofing, thatch	3
	Straw, Coca-cola sign	2
	None, roof with large holes	1
Function 4.	Storage of water	
	Automatic: house piped	5
	Cistern	4
	Clay barrel designed solely for water storage	3
	Large clay jar	2
	Buckets, tin pails	1
Function 5.	Transportation of water to home	
	Automatic, faucet in home	5
	Hand pump, faucet in yard	4
	Bucket with pulley in yard	3
	Bucket from well or stream in own yard	2
	Carry over 100 yards	1
Function 6.	Lighting	
	Electric fixture, lamps	5
	Electric bare bulb	4
	Carbide or gasoline lantern	3
	Kerosene lamp	2
	Candle, open fireplace	1
Function 7.	Preservation of perishable food	
	Electric or gas refrigerator	5
	Ice box	4
	Spring house, cellar	3
	Window box, clay jar	2
	None	1
Function 8.	Eating: place settings of flatware	
	Over two per person--(sets of knife, fork, and spoon)	5
	One to 1.9 per person	4
	One utensil or more per person, but less than one place setting per person	3
	Partial for entire household--fewer utensils than people	2
	None--use hands	1

Table 6-Continued

		Score
Function 9.	Disposal of human wastes	
	Flush toilets	5
	Modern pit toilet	4
	Privy	3
	Trench and stick in fence corner	2
	None	1
Function 10.	Transportation	
	Owned or leased automobile; in some situations, a motor boat or airplane	5
	Motorcycle or other small motorized vehicle	4
	Horse with wagon or buggy	3
	Bicycle, horse or mule	2
	Foot only, or public facilities	1
Function 11.	Cooking food: equipment	
	Electric or gas range	5
	Hot plate, kerosene or oil stove	4
	Manufactured wood stove	3
	Clay stove, mud table, hibachi	2
	Three rocks, bare ground	1
Function 12.	Fuel for cooking	
	Electricity or gas	5
	Oil	4
	Wood or charcoal	3
	Small sticks, scrap wood	2
	Weeds, leaves, dung	1
Function 13.	Cleaning floors of home	
	Vacuum cleaner	5
	Electric broom or sweeper	4
	Purchased dust mop and/or good grade broom	3
	Native broom or mop	2
	None	1
Function 14.	Washing dishes	
	Automatic dishwasher	5
	Sink with drain	4
	Dishpan (no sink)	3
	Multipurpose pan: kettle or washpan	2
	Wash in stream or at pump	1

SOURCE: John C. Belcher: "A Cross-Cultural Household Level of Living Scale," Rural Sociology, Vol. 37, No. 2, June 1972, pp. 213-217.

Table 7. Comparison of level-of-living scores for Georgia, Puerto Rico, and the Dominican Republic

Scale score	Camden County, Georgia 1965		Rural Puerto Rico 1966		Rural Dominican Republic 1967	
	N	percent	N	percent	N	percent
70	0	0.0	0	0.0	0	0.0
65-69	134	30.4	21	3.9	0	0.0
60-64	191	43.3	80	14.7	0	0.0
55-59	41	9.3	125	22.9	0	0.0
50-54	32	7.3	129	23.7	3	0.2
45-49	28	6.3	93	17.1	17	1.0
40-44	12	2.7	53	9.6	60	3.5
35-39	3	0.7	32	5.9	223	12.9
30-34	0	0.0	12	2.2	492	28.4
25-29	0	0.0	0	0.0	666	38.5
20-24	0	0.0	0	0.0	258	14.9
15-19	0	0.0	0	0.0	11	0.6
14	0	0.0	0	0.0	0	0.0
Total	441	100.0	545	100.0	1,730	100.0

SOURCE: See Table 6.

Table 8. Broome County, New York, Level-of-living Scale

Item	Scorable response*	Correlation with occupational status†
Washing machine	Automatic, semiautomatic, or combination washer-dryer	.36
Water supply	Inside faucets, both hot and cold water	.35
Bath	Inside, both tub and shower	.33
Separate freezer	Possession	.31
Sweeper	Electric	.31
Number of automobiles	Two or more	.31
Magazines taken	Four or more	.31
Piano	Possession	.29
Kinds of clocks	Electric	.29
Pressure	Possession	.28
Telephone	Possession	.28
Basement	Concrete floor	.27
Acid of automobiles	Two years old or newer	.25

*Response for which a point is given.

†Phi coefficient.

SOURCE: 8, 9, and 10: Charles E. Ramsey and Jenaro Collazo, "Some Problems of Cross-Cultural Measurement," Rural Sociology, Vol. 25, March 1960 (91-106), p. 98.

Table 9. Puerto Rican Level-of-living Scale

Item	Scorable response*	Correlation with income†
Bed	One or more with spring and mattress	.61
Newspapers and magazines	Subscribe to one or more of either	.60
Table knives	One or more	.60
Linoleum	Possession	.58
Radio	Possession, any type	.58
Sofa	Possession	.57
Dining room table	Possession, any type	.55
Living room table	Possession, any type	.54
Bowls (china or glass)	One or more	.54
Rocking chairs	One or more	.53
Arm chairs	One or more	.53
Books	One or more	.52
Bath	Shower or porcelain tub	.52
Saucers	Five or more	.52
Platter	Possession	.51
Frying pan	Possession	.51
Cook stove	Electric, gas, or kerosene	.50
Water storage	Water pipe or filter jar	.49
Can opener	Possession	.48
Electric lights	Possession	.48
Drinking glasses	Five or more	.48
Auto or truck	Possession of either	.47
China dishes	Five or more	.46
China closet	Possession	.45
Orange squeezer	Possession, any type	.45
Refrigerator	Electric or gas	.45
Forks	One or more	.45
Home exterior	Completely painted	.44
Wall or ceiling lamp	Possession	.44
Tray	Possession	.43
Pepper	Possession	.43
Kitchen knives	Two or more	.43
Wardrobe (clothes closet)	Possession	.42
Clock	Possession, any type	.42
Egg beater	Possession	.41
Sewing machine	Possession	.41
Coffee cups	Five or more	.40
Dresser	Possession	.37
Grater	Possession	.37
Toilet	Indoor toilet	.36

*Response for which a point is given.
†Phi coefficient.

SOURCE: See Table 8, pp. 96, 97.

Table 10. Items with Equal Cutting Points which are Positively Correlated with Occupational Status with Culture Controlled

Item	Response scorable as high	% of Puerto Ricans possessing item	% of Broome Co. respondents possessing item
Sewing machine	Electric	1	46
Refrigerator	Electric or gas	11	97
Exterior of house	Other than unpainted or partially painted frame	17	93
Kitchen stove	Electric or gas	3	93
Washing machine	Electrically powered	2	94
Iron	Electrically heated	31	98
Bathroom	Bath tub and shower	5	39
Automobile	Ownership of at least one other than truck	5	91
Pressure cooker	Possession	2	52
Toilet	Inside house	6	84

SOURCE: See Table 6.

One additional problem that we face in using level of living scales based largely on items of material culture, mainly changes in technology, is whether such changes really do constitute an improvement in people's lives. This is what we want to know. But it may be that the diet of farm people was better before they went to work in the factory, their health was better when they were outdoors and did not wear city clothes, smoke, or were subjected to diseases of civilization. Spending money on fancy clothes rather than more fundamental things may constitute a loss.

Nonetheless for many purposes the level of living scale gives us a tool for grasping the level of affluence of a local group and discovering in its own terms the array of social, educational, cultural, economic and other correlates of various levels of affluence or poverty. It is widely accepted for this purpose and it has face validity. In another unit, I shall show how it is related to measurements based on household food consumption.

HEALTH MEASURES

Health measures are widely used in national level studies. In national social indicators studies you will see measures such as infant mortality, early childhood mortality, incidence of disease and the like. These are important and certainly significant aspects of human well-being. But if the desire is to study social welfare at a household or village level, a single measure that is applicable to all people or all villages is needed. Infant mortality at most says something about a certain group of women of child-bearing age. Absence of a particular disease, such as tuberculosis, is certainly significant, but does not necessarily indicate health. Nor does freedom from any other disease, even if such facts could be known. Obviously there are many costs in time and technology as well as in money to make any such assessment. But absence from disease does not indicate degree of health. Indeed there is no good measure of adequacy of health. Likewise unless an individual has a distinct nutritional deficiency disease such a pellagra or kwashiokor, it is very difficult to say that one individual is better nourished than another or to what degree. With children measures of height and weight are sometimes used as measures of nutritional status, but there is a great doubt about what good height and weight for a given group really are.

Health institutions--hospitals, physicians, nursing care, insurance programs, vaccination programs, sanitation, drinking water--would all be a part of the assessment of village or district differentiation, and they are importantly related to social welfare. But they do not necessarily indicate family health for there are many discrepancies in use; also many other factors influence family health. Such institutions do not necessarily indicate a family's or village's own economic capacity, since public health systems often must be organized at a higher level of government, state, region, or nation, and such regional or countrywide systems may not discriminate poor from rich villages or districts. For such reasons use of health measures as primary indicators of family or village welfare present many problems that no one has solved. While one would certainly like to use any available information about health along with other measures, it is not as good as food for a core measure.

Ideally one might want to use some kind of subjective measure of personal satisfaction or mental health. Again, this area of measurement is not adequately developed for the present purpose. Theory is difficult, measures complex and much argued, and at root happiness is perhaps a philosophical question. There may be many legitimate research needs to know what people think, but measurement of their general level of welfare is not one of them.

I believe that food consumption meets many of the objections I have voiced in relation to physical and mental health measures. Therefore we will turn to this general question of nutrition that is closely related to health.

THE HOUSEHOLD FOOD SURVEY

The household food consumption survey is widely used in research in all parts of the world. Ideally nutritionists would like to assess precisely what nutrients each family eat and in what quantities and they would like this information over a long period of time to allow for random and seasonal variation. They would like measurements made by nutritionists in each household of food stored, bought, used, and thrown away. They would also like anthropomorphic measurements of heights and weights and a clinical and laboratory assessment of health and nutritional status. This can be done anywhere that someone can assemble the requisite technical aid, the money and the time.

Table 11. Sample Household Food Consumption Schedule

What foods did your family eat yesterday? (Day of Week ___________)

Meals	Menu Items	Food Items, Kinds	Amounts, if known	P,H,F	Comments
Breakfast:					
Lunch:					
Supper:					
At Other Times:					

Notes: P - Purchased
H - Home grown or gathered
F - Free gifts or supplements

	Breakfast	Lunch	Supper
No. guests present			
No. family members absent.			

Table 11-Continued
How often does your family eat the following foods?

Food	No. of Meals per			Remarks
	Day	Week	Month	
Cereals and Cereal Products				
Corn				
Rice				
Wheat				
Barley				
Oats				
Quinoa				
Bread				
Other				
Milk Products				
Milk, fluid				
Milk, powdered				
Milk, evaporated				
Cheese				
Other				
Eggs				
Meats				
Fish				
Beef				
Pork				
Mutton				
Liver				
Poultry				
Guinea pig				
Intestines				
Other				
Fats and Oils				
Butter				
Vegetable oil				
Animal fats				
Other				
Legumes				
Chocho				
Dried beans				
Dried peas				
Lenteja				
Peanuts				
Other				
Tomatoes				
Vegetables, Vitamin A-rich (Leafy, green, and yellow)				
Spinach				
Carrots				
Parsley				
Lettuce				
Yellow squash				
Other				
Other Leafy, Green, and Yellow Vegetables				
Sweet potatoes				
Green beans				
Green peas				
Cabbage				
Onion tops				
Turnip tops				
Other				

Table 11-Continued

Food	No. of Meals per			Remarks
	Day	Week	Month	
Other Vegetables, Vitamin A-poor				
Onions				
Beets				
Turnips				
Radish				
Other				
Starchy Vegetables				
White potatoes				
Yuco				
Oca				
Other				
Citrus Fruits				
Oranges				
Naranjilla				
Lemons				
Limes				
Pineapple				
Grapefruit				
Starchy Fruits				
Banana				
Plantain				

Table 12. Guttman Scale Derived from Food Reports in Rural Mexico

Step Number	Item	Percent of Sample
1	Tortilla (corn flat bread, staple cereal)	100
2	Frijol (black beans, eaten cooked and mashed)	95
3	Meat, fish, chicken or eggs (nondairy animal food)	77
4	Wheat bread (prepared product, secondary cereal)	61
5	Dairy food (milk, cheese, or coffee with milk)	37
6	Platano (plantain)	20

Number of families = 377.
Coefficient of scalability = 0.77.
SOURCE: See Table 16.

Table 13. Rank Correlations Between Food Scale and Indicators of Dietary Complexity* in Rural Mexico

Indicator	Correlation with Food Scale (Kendall's tau)
Noon variety	0.48
Breakfast variety	0.15
Evening variety	-0.09
Fruit frequency	0.51
Meat, fish, chicken, eggs, frequency	0.47
Vegetable frequency	0.02

* Dietary complexity as indicated by meal variety and food-group frequencies.
SOURCE: See Table 16.

Table 14. Families' Reports of Frequency of Verduras* at Different Scale Levels in Rural Mexico

Frequency of Verduras	% of Families Reporting at Scale Level		
	Low 1 & 2	Medium 3 & 4	High 5 & 6
0	72	61	46
1-3	26	37	50
4-6	2	2	4
Number of families	88	151	138

* Leafy vegetables, tomatoes, carrots.
SOURCE: See Table 16.

Table 15. Families' Reports of Frequency of Condiments* at Different Scale Levels in Rural Mexico

Frequency of Condiments	% of Families Reporting at at Scale Level		
	Low 1 & 2	Medium 3 & 4	High 5 & 6
0	16	20	36
1 or 2	52	47	36
3 or 4	23	24	25
5 or more	9	8	4
Number of families	88	151	138

* Onions, garlic, tomato paste, peppers.
SOURCE: See Table 16.

Table 16. Rank Correlations Between Food Scale and Some Indicators of Dietary Complexity in Rural Mexico

	Kendall's tau
Fruit frequency	0.51
Meat, fish, chicken, eggs, frequency	0.47
Vegetable (over-all), frequency	0.02
Verduras* frequency	0.25
Condiments**frequency	-0.01

* Leafy vegetables, tomatoes, carrots.
** Onion, garlic, tomato paste, peppers.

SOURCE: Judith Price Chassy, A.G. Van Veen and F.W. Young: "The Application of Social Science Research Methods to the Study of Food Habits and Food Consumption in an Industrializing Area," American Journal of Clinical Nutrition 20, no.1, January 1967, p. 56-61.

Table 17. Ghanian Food Scale

Scale Step	Item Content	Percent of Sample
1	Tomato Onion Pepper	100
2	Fish*	99
3	Palm oil, palm nuts, cooking oil	86
4	Rice, yam	59
5	Bread	35
6	Beverages**	24
7	Milk	23
8	Eggs	6
9	Banana	5
Total cases		(111)

Coefficient of scalability .65.

* Probably only a flavoring in the soup or stew.

** Coffee, tea, vitacup, milo, ovaltine, and complan.

SOURCE: Francos A. Larkin: "Household Structure and Children's Health in Ghana," Unpublished Ph.D. thesis, Cornell University, 1968, p.41.

Table 18. Philippine Food Consumption Scale

Scale Step No.	Item Content	Number in Scale Step	Per Cent	Cumulative % Discriminated
0	Rice	23	11.3	100.0
1	Vegetables	46	22.5	88.6
2	Dried, salted, or smoked fish	20	9.8	66.1
3	Coffee	48	25.5	56.3
4	Frying oil	40	19.6	32.8
5	Eggs or milk	27	13.2	13.2

Coefficient of Scalability = 0.63.

SOURCE: Amparo G. Rigor: "Family and Barrio Differentiation in Nueva Ecija, Philippines," Unpublished Ph.D. thesis, Cornell University, 1971, p. 61.

Table 19. Factor Loadings of Rural Mexican Differentiation Measures on First Two Rotated Factors

Variable		I	II
Father's occupational aspiration for sons	1	.19	-.85
Father's educational aspiration for sons	2	.14	-.86
Typology of house construction	3	.49	-.31
Guttman scale of level of living	4	.81	-.22
Index of level of living	5	.87	-.22
Social participation index	6	.72	-.26
Food-consumption scale	7	.67	-.28
Education of male head	8	.39	-.56
Traditional-modern medical-care pattern	9	.53	-.08
Evening family-activity typology	10	.52	-.29
Number of new household items in last two years	11	.71	-.05
Fiesta-attendance scale	12	.41	-.28
Occupational prestige typology	13	.29	-.52

SOURCE: Frank W. Young and Ruth C. Young: "The Differentiation of Family Structure in Rural Mexico", Journal of Marriage and the Family, February 1968, p. 158.

However, there is widespread use of a household food consumption survey that yields much less information than this and is considered useful. The full nutritional assessment is not practical in most cases and indeed for purposes of much research not necessary. The household food consumption survey in common use asks the householder about meals, menus, purchasing habits, food raised, who eats what elsewhere. It gets the householder to tell what she cooked, what the family ate, and contains information about estimated quantities using weights or volumes in terms commonly used in the area. Respondents are asked how many times a week they eat various foods. Table 11 is an example of such a survey schedule. Such food surveys can be used in conjunction with precise clinical and laboratory assessment in order to validate the method or find the best selected items to indicate the quality and quantity of the diet. For instance in such a study, the researcher might find that the number of times a week the family eats meat, or the variety of foods eaten will classify the family in comparison with other families sufficiently well and in the same ranking as a complete assessment. The value of doing a complete nutritional study would be the help it would give in finding the best items that one could get information on easily--(by simply asking the householder)--that could stand for more elaborate data, and that would classify him in the same way that more elaborate data would do.

Such attempts have been made by researchers doing what is termed social nutrition research. These researchers are interested in classifying the dietary status of families so that they can do research on the social and economic characteristics of the family associated with better or worse diet. In order to do a good job on the social context of family diet, the clinical assessment is very expensive. Such researchers have found that the variety of foods eaten correlates well with quantity and stands in quite well for quality. Frequency of eating certain key or expensive foods, such as meat, eggs, milk, fish, can be used similarly. The study by Chassy, et al (1967) of Mexican households reported how a scale measuring food variety is devised and how it relates to frequency of eating certain key foods. It also cites other studies where frequency of eating related well to quantity eaten and to blood analysis indicating nutritional status. Table 12 shows the food scale that is based on a one-day recall of all foods served the day before by the homemaker. Tables 13 through 16 show the relations of the scale to other aspects of food consumption.

In terms of patterns of eating among rural people the world over this is a reasonable approach. Most poor rural people the world over live on a basic starchy staple and add small quantities of other food to this as they are able to do so. What is added and how much tend to expand together and in a somewhat orderly way, based on availability and local custom. Starting with those produced at home and moving up to imported items, food habits and food resources are developed over long periods of time. That they can be found to exist in an orderly and predictable way conforms well to common sense.

Many other researchers have produced similar results. Larkin (1970) did such a study of food and health practices in Ghana that also included a clinical and laboratory examination of the children of the households surveyed (Table 17) and Rigor did a similar study in the Philippines (1971) (Table 18). This method of getting a sufficient amount of dietary data to use in investigating its social and health context has been used since in a variety of countries.

Some other research is emerging that suggests that dietary information from food consumption surveys can be reduced to a small number of components. Guthrie, et al (1973) conducted a study of pre-school children using diet and many other nutritional measures. All of the dietary information in the factor analysis performed fell into only two of the ten components: one factor had high loadings on iron, vitamin in A, thiamin, riboflavin, niacin and ascorbic acid; another had high loadings on kilocalories, protein, fat, carbohydrate, calcium, vitamin A and Riboflavin. This parallel's Chassy's finding that vegetables and some other foods did not fit into a scale in the Mexican study. If studies are repeated in other areas, the hope is that most items of consumption will fit into a small number of scales or measures.

This brings us to the second question. Can food stand as a general measure of family welfare? Do household patterns of food consumption relate to other measures of social welfare--to education, level of living, income, housing, medical care, and the like? A number of studies have explored just this question. In the first of a series, F. Young & R. Young (1968) explored the relation of a Mexican food consumption scale to other such measures by means of a factor analysis and found that many of these correlated highly with a single factor (see Table 19). In the Larkin study in Ghana and in the Rigor study in the Philippines another pattern of relations between the food scale and other measures of household complexity seemed to emerge. In both cases the food scale and the other measures seemed to form a quasi-simplex. This is a measure devised by Guttman and what it means is that the various measures all do measure the same concept, but that each of them does a better job of measuring a different part of the population. The measures in a simplex when put in order have decreasing correlations going from either side of the diagonal. The reason for this is that each measure is related strongly to the measure on either side of it, and that the relations between these adjacent measures, when controlled out leave no relation between a measure and those measures that are more distant. In these cases, the food scale on one side of each correlation matrix appears to do a better job of measuring the poor people in the sample, and other measures of housing, household possessions, health and sanitation a better job of measuring the more affluent. Similar studies need to be carried out on other places testing whether such relations continue to hold. If so, this would point to food as a best measure of the level of living of the poor. (See Tables 20 and 21.)

Many of the other characteristics of family welfare to which the food patterns relate are peculiar to a particular area, such as types of housing. Others depend heavily on government organization or input, such as health services or schools, or electrification. Others such as level of living scales based on household objects serve the purpose well now, but will be out of date in a few years when technology will have changed. But in a few years even if people are using wheat instead of corn, using packaged and processed food instead of, fresh, and buying instead of growing, it will still be possible to compare the adequacy of their diet then in terms of quantity and variety and sufficiency of nutrients with the diet they now have. Therefore, I am suggesting that the research procedure to follow would be to study dietary patterns along with a variety of other measures of social welfare--health indicators, household and farm technology, sanitation, transportation, education, housing and the like and relate diet to these. Then in comparing one village with others that live in a different culture or type of economic structure, other measures might not have the same meaning or offer possibilities for comparability, but food might serve as an anchor variable that would serve this purpose. For example, how do you compare urban apartment dwelling to village housing? Similarly if one should use such data to compare the welfare of people of a village now and ten years after, their dietary sufficiency might be the most comparable and stable element.

One further problem remains. Suppose one were to gather information from each family in a village and then compare this aggregated information on family welfare to measures based on an assessment of village or district institutions, such as the market, the structure of retail trade, the diversity and complexity of village institutions. Would they correspond? A later section will discuss this question of village or district level assessment more fully, but I will mention that several researchers have related such village level assessment with the level of family welfare. In several studies in several different countries, they have found that villages rated as more differentiated (with a greater number and variety of institutions, stores, etc.) tend to have residents with a higher level of family living.[3]

At first this sounds like one of these exercises that sociologists do to prove in some elaborate manner what everyone else in the world knows in a common sense way all along. But if we reflect more closely it is apparent that this piece of information gives us a lead to a more efficient and economical and less time-consuming way to measure individual household progress. If we know the precise relation between the household food consumption patterns and the quantity and variety of food found in the village retail market system, the possibility is opened of assessing welfare progress more efficiently.

So far we have suggested that if methodological research is conducted to find out the best measures, we might be able to assess a great deal about the level of family welfare by using patterns of food consumption. Secondly, we could compare families from place to place and time to time on the basis of food. Third, if we find the precise relation between aggregated family food consumption patterns and village retailing patterns, the latter could serve for assessment of regional progress in place of the more expensive and time-consuming household surveys.

NATIONAL SOCIAL INDICATORS

Before going into village-district level measures, a discussion of the national level is in order. One approach is the food balance sheet. The food balance sheet is a method of arriving at the net food supply available for human consumption throughout a whole country. This is a method for bringing together all the information on the supply and use of various individual foodstuffs available to a country at a given period of time from all sources whether produced locally or imported. It considers production, seed use, animal food, waste on the farm and in distribution, industrial nonfood use, processing or extraction losses exports and the net food supply. Information for this balance sheet is obtained from a variety of sources; in the case of Mauritius (Simmons and Poleman 1974) it was obtained from the Extension Division, the Fisheries Division, The

Table 20. Correlation Matrix of Measures of Household Complexity in Ghana

(Gamma)

		1	2	3	4
Food Scale	1	--	.22	.1[illegible]	.16
Sanitation	2	.22	--	.48	.29
House typology	3	.16	.48	--	.45
Household possessions	4	.16	.29	.45	--

SOURCE: Frances Larkin: "Household Structure and Children's Health in Ghana," Unpublished Ph.D. thesis, Cornell University, 1968, p. 61.

Table 21. Intercorrelations in Simplex Order Among Five Measures Of Family Differentiation in Nueva Ecija, Philippines (N = 204)

		1	2	3	4	5
Food Consumption	1	--	.287	.269	.244	.062
Household Possessions	2	.287	--	.548	.380	.312
House Typology	3	.269	.548	--	.394	.277
Health Practices	4	.244	.380	.394	--	.251

SOURCE: Amparo G. Rigor: "Family and Barrio Differentiation in Nueva Ecija, Philippines," Unpublished Ph.D. thesis, Cornell University, 1971, p. 115.

Department of agriculture, The Marketing Board, the Census of Industrial Production and from the Department of Customs and Exise for information about imports and exports.

If you look at Table 22 you will see that it takes production and imports and subtracts from these totals all kinds of non-food uses and waste to arrive at net supplies. The authors tell in detail how information was obtained from a variety of sources for the different foods: cereals, starchy roots, pulses and nuts, vegetables, sugar and syrups, fruit, meat, eggs, fish, fats and oils. On the right hand side of Table 22 you will see that all of this information is converted into nutritional terms giving, for example, calories and proteins per capita per day. Another similar study was conducted in Ceylon by Jogaratnom and Poleman (1969).

In the Mauritius research, a sample survey of 894 rural and urban households was also conducted to get the family food purchases. These were obtained daily for two one week periods during the year. From these 894 household food purchasing budgets the researchers also made an estimate of national food supplies. In Table 23 it is evident that the estimates made in these two different ways match quite well. Upper income levels were excluded from the household food budget survey, and if they had been included the figures would probably be even closer.

Both methods had the same goal, to measure national food supplies. They utilized very different types of data--the one from information procured from a sample of households on their food purchases; the other procured information from government bureaus on agricultural production, imports and exports of food and various sources of loss during the course of food production and processing. They arrive at similar conclusions from these very different methods. In other countries, one might want to check to see if the information that was obtained from the records in government bureaus was accurate. If so, such records provide a much simpler, less expensive and less time consuming method of finding out about food supplies than taking two sets of week long records on nearly a thousand households. However, if government records are not kept that are sufficient for this purpose (and this is often the case) a sample survey of households, done carefully, can give us the same type of information about food supplies quite accurately.

National food supplies can be measured in either of two ways quite satisfactorily. The question then arises as to how food supplies compare with other measures of national welfare. Many studies have been conducted that make such comparisons. I have included one of these for illustration. In the study by Harbison and his colleagues (1970), is a list of welfare measures they used in their study, such as per capita gross national product, per capita energy consumption, newspapers, telephones, literacy, several health measures and food measures, educational measures and many others. They correlated such measures for 112 countries Table 24. If you look at the four food variables, namely grams of protein, per cent animal protein, calories and per cent starch, you will see that these measures are highly related to the other measures of national welfare. Therefore, one might say that if one wished to measure national welfare and only had quite accurate measures of food supplies, such measures would give one a very good idea of the level of welfare as a whole.

Table 25 shows the correlations among this same set of variables but this time for the 31 sub-Saharan African countries only. Comparison with Table 24 show that many of these correlations are greatly reduced in Table 25. The same general fact is true if we look at correlations only among developed countries, Latin America countries or any other area group. Within any one area (the developed countries are the United States and Europe for the most part), correlations are from moderate to low among the many measures of national development. It may be that the same problems exist in national measurement as in the household measurement of social indicators, and that one reason that correlations among them are not higher is tnat some national measures do a better job of measuring the differences of level of development in poor nations and some in more affluent. Again if we must choose among these an argument can be made for food measures as compared with measures of urbanization, GDP, health services, educational attainment and media distribution in that all of these latter have problems that food measures may be free of . Most of the latter measures apply mainly to urban people and more affluent. Food reaches the rural poor.

These studies show us then, that national food supplies can be measured at the household level and the national level, and that information obtained at these two levels matches quite well. They show us that national food supply estimates could stand quite well as measures of national social welfare. If you look back at Figure 1 you will see that we have discussed food measures and other social welfare measures at the household level and at the national level. At both levels food is related to other social welfare measures. And household food supply information is related to estimates of food supply obtained at a national level from figures on production, imports and exports, national

Table 22. Mauritius: Food Balance Sheet, 1960-1964
(Population: 681,619 on June 30, 1962)

Foods	Production	Imports	Exports	Supply	Seed	Nonfood uses	Waste	Net food supply	Per capita kg./yr.	Per capita gr./day	Per capita cal./day	Per capita Protein (gr./day)	Per capita Fat (gr./day)
	metric tons per year												
Cereals													
Rice, government	—	38,654.4	n.a.*	38,654.4	—	—	1,133.1	38,321	61.456	222.2	801.5	15.8	2.3
Rice, trader's	—	11,341.4	1,288.8	10,052.6	—	—	288.2	9,807	14.388	39.4	141.6	2.8	0.4
Wheat flour	—	25,302.4	402.2	24,900.2	—	—	311.2	23,949	35.740	100.7	254.4	9.9	0.3
Groats & cereals	—	81.6	—	81.6	—	—	—	82	0.120	0.3	1.2	—	—
Macaroni	—	118.4	—	118.4	—	—	—	118	0.173	0.5	1.8	—	—
Bakery products	—	199.0	0.6	198.4	—	—	—	198	0.290	0.8	2.9	—	0.2
Meal & flour, n.e.s.	—	1,567.6	0.2	1,567.4	—	—	—	1,567	2.300	6.3	22.5	0.6	0.1
Cereal preparations, n.e.s.	—	95.0	—	95.0	—	—	—	95	0.139	0.4	1.4	—	—
Total								82,580	120.568	371.3	1,204.9	33.0	4.8
Starchy roots													
Potatoes, Irish	3,967.8	4,261.2	0.6	8,228.4	604	—	607.1	7,017	10.295	28.2	19.7	0.5	—
Sweet potatoes	700.0	n.a.†	—	700.0	—	—	70.0	630	0.924	2.5	2.4	—	—
Manioc, cassava	889.2	2.6	—	891.8	—	201.7	22.1	668	0.980	2.6	2.6	—	—
Flours & flakes of potatoes, vegs., etc.	—	215.4	—	215.4	—	—	—	215	0.316	0.9	3.1	—	—
Total‡								8,530	12.514	34.2	27.8	0.5	—
Sugars													
Sugar, raw	485,917.8	—	479,138.2	6,779.6	—	—	—	6,779	9.946	27.2	95.5	0.3	—
Sugar, refined	19,303.2	72.0	302.7	19,072.5	—	—	—	19,073	27.981	76.7	296.0	—	—
Candy, confectionery	—	281.4	10.2	271.2	—	—	—	271	0.398	1.1	3.9	—	—
Total								26,123	38.325	105.0	396.2	0.3	—
	metric tons per year												
Pulses and nuts													
Pulses, dried	—	6,048.6	60.8	5,987.8	—	—	—	5,988	8.785	24.1	81.9	5.3	0.4
Groundnuts (in shell)	411.6	281.6	—	693.2	—	—	—	693	1.017	2.8	10.0	0.5	0.9
Edible nuts, n.e.s.	—	74.4	4.6	70.8	—	—	—	71	0.104	0.3	0.8	—	0.1
Coconuts, ripe	—	846.0	—	846.0	—	—	—	846	1.241	3.4	3.5	0.1	0.3
Coconuts, immature	170.0	—	—	170.0	—	—	—	170	0.249	0.7	0.4	—	—
Total								7,779	11.413	31.3	98.5	5.9	1.9
Vegetables													
Tomatoes	5,449.8	—	—	5,449.8	—	—	544.9	4,905	7.196	19.7	3.7	0.2	0.1
Green & leafy	9,308.4	5.1	—	9,313.5	—	—	931.4	8,382	12.298	33.7	6.9	0.3	0.1
Other fresh & frozen	13,101.2	2,500.0	212.4	15,388.8	—	—	1,376.8	14,012	20.557	56.3	12.4	0.6	0.1
Dried, canned	—	400.2	1.8	398.4	—	—	30.6	368	0.541	1.4	0.8	—	—
Total								27,667	40.592	111.2	23.8	1.2	0.3
Fruits													
Citrus	n.a.	1,155.0	28.4	1,126.6	—	—	112.6	1,014	1.488	4.1	1.3	—	—
Apples	—	498.8	0.0	498.8	—	—	49.9	449	0.659	1.8	0.9	—	—
Other, fresh	2,676.8	234.0	0.2	2,910.6	—	—	291.1	2,620	3.844	10.5	4.3	0.1	0.0
Dried	—	213.4	1.4	212.0	—	—	—	212	0.311	0.9	2.1	—	—
Preserved, prepared	—	245.2	0.2	245.0	—	—	—	245	0.360	1.0	1.3	—	—
Juices (1000 liters)	—	216.2	—	216.2	—	—	—	216	0.317	0.9	1.2	—	—
Total								4,756	6.978	19.2	11.4	0.1	0.0
Meats													
Beef	1,013.2	1,640.8	—	2,654.0	—	—	—	2,654	3.894	10.7	24.1	1.6	1.9
Pork	406.4	72.4	—	478.8	—	—	—	479	0.703	1.9	7.3	0.2	0.7
Goat	205.1	—	—	205.1	—	—	—	205	0.301	0.8	1.2	0.1	0.1
Mutton, lamb	70.2	425.2	—	495.4	—	—	—	495	0.726	2.0	4.8	0.2	0.4

Table 22 (continued)

Venison	30.5	—	—	30.5	—	—	—	30	0.067	0.2	0.2	—	—
Poultry	134.5	131.6	—	266.1	—	—	—	266	0.390	1.1	1.3	0.1	0.1
Other (incl. offals)	n.a.‡	169.2	0.6	170.6	—	—	—	169	0.264	0.7	0.9	0.1	—
Dried, salted, smoked	—	93.0	0.2	91.8	—	—	—	92	0.130	0.4	2.0	0.2	0.7
Canned, prepared	—	258.5	0.6	256.8	—	—	—	257	0.436	1.2	2.8	0.3	0.2
Total								4,773	7.002	19.2	44.8	2.8	3.3
Eggs													
Fresh hens'	1,228.8	38.6	0.1	1,267.3	—	—	—	1,267	1.880	2.1	7.3	0.6	0.3
Fish													
Fresh (all kinds)	1,123.2	881.1	0.2	1,880.1	—	—	—	1,880	2.384	6.3	4.0	0.6	0.2
Salted, smoked, dried	—	1,335.1	0.6	1,334.8	—	—	—	1,335	1.980	5.4	9.6	1.3	0.4
Crustacea, molluscs	38.0	161.6	2.6	198.8	—	—	—	200	0.296	0.8	0.2	—	—
Canned	—	1,100.2	0.4	1,099.8	—	—	—	1,100	1.614	4.4	9.7	0.9	0.7
[illegible]	102.2	199.2	—	301.4	—	—	—	300	0.442	1.2	8.8	0.2	—
Total								4,540	6.689	18.3	32.5	3.2	1.3
Milk, milk products													
Fresh, whole, cows'	10,000.0	15.8	—	10,015.8	—	—	—	10,016	26.421	72.4	43.4	2.4	2.2
Condensed, evaporated	—	713.0	21.0	722.0	—	—	—	722	1.060	2.9	9.7	0.2	0.2
Dried (all kinds)	—	1,350.7	28.1	1,322.6	—	—	—	1,322	2.034	7.8	36.6	2.2	1.0
Cheese (all kinds)	—	160.3	0.2	160.1	—	—	—	160	0.235	0.6	1.8	0.1	0.1
Milk foods	—	285.5	—	285.5	—	—	—	286	0.420	1.2	4.6	0.2	0.1
Total								21,136	31.080	84.9	96.1	5.1	4.1
Fats and oils													
Soya oil	—	1,168.0	0.1	1,158.6	—	—	—	4,080	6.543	17.9	158.2	—	17.9
Cottonseed oil	—	1,370.4	32.5	1,133.8	—	—	—	1,134	1.664	4.6	40.7	—	4.6
Coconut oil	—	323.4	14.2	309.2	—	309.2	—	—	—	—	—	—	—
Oil from seeds, nuts, n.e.s.	—	1,040.2	7.0	1,041.2	—	—	—	1,041	1.527	4.2	37.1	—	4.2
Margarine	—	1,208.6	29.0	1,180.6	—	—	—	1,180	1.734	4.8	34.6	—	3.9
Shortening, ghee	—	76.0	—	76.0	—	—	—	76	0.111	0.3	2.6	—	0.3
Butter	—	339.8	12.6	327.2	—	—	—	327	0.480	1.3	9.5	—	1.1
Total								8,227	12.069	33.1	282.5	—	32.0
				Litres									
Alcoholic beverages													
Beer	1,120,771.6	2,300,552.6	71,900.2	3,353,326.0	—	—	—	3,353,326	5.187	14.2	4.0	—	—
Wine	5,112,580.4	433,923.0	246,085.8	5,300,518.6	—	—	—	5,300,519	7.776	21.3	22.4	—	—
Cider	—	45,972.1	—	45,972.1	—	—	—	45,972	0.067	0.2	0.1	—	—
Spirits	1,515,735.8	133,152.6	10,023.8	1,638,282.6	—	—	—	1,638,283	2.404	6.6	14.7	—	—
Total								10,320,100	15.434	42.3	42.2	—	—
Total											2,388.6	10.2	80.5

*All rice exports and reexports are deducted as "Rice, trader's".

†Imports of sweet potatoes are included as imported vegetables.

‡Some offals are sold from local slaughterhouses, but the quantity is not available.

SOURCE: Emmy Bartz Simmons and Thomas T. Poleman: "The Food Balance Sheet as a Parameter of Tropical Food Economies: The Case of Mauritius", Ithaca, New York, State College of Agriculture and Life Sciences, Cornell International Agriculture Bulletin 29, June 1974, pp. 9-12.

Table 23. Mauritius: Comparison of Food Balance Sheet and Family Budget Inquiry Availabilities, by Major Food Groups*

Food group	Food Balance Sheet			Family Budget Inquiry		
	Grams	Calories	Protein (gr.)	Grams	Calories	Protein (gr.)
Cereals	371.5	1,334.9	29.0	428.2	1,453.1	32.5
Starchy roots	34.2	27.8	0.5	28.5	20.0	0.5
Sugar, syrups	105.0	396.2	0.3	68.9	261.2	0.2
Pulses	31.3	99.5	5.9	34.7	119.5	7.8
Vegetables	111.8	23.8	1.7	83.3	16.4	1.4
Fruits	19.2	11.4	0.1	15.2	6.1	0.1
Meats†	19.2	44.8	2.8	12.5	22.7	2.0
Eggs	5.1	7.3	0.6	2.4	3.4	0.3
Fish	18.3	32.3	3.2	24.2	25.7	3.5
Milk, milk products	84.9	96.1	5.1	123.7	108.5	5.9
Fats and oils	33.1	282.5	--	33.2	287.8	--
Alcoholic beverages	...	42.2	--	...	43.3	--
Miscellaneous	...‡	...	...	62.3	50.4	...§
Total		2,398.8	49.2		2,418.1	54.2

* Calculated from data in Tables 22.

† Poultry figures not included in the budget inquiry data.

‡ Figures for miscellaneous items not available through the balance sheet approach.

§ Not available.

SOURCE: See Table 22, page 29.

Table 25. SIMPLE CORRELATION COEFFICIENTS FOR SUB-SAHARAN AFRICAN COUNTRIES
(for the 26 variables analyzed in the regression equations)

1% significance level with n = 31 is 0.456

	Energy	Doc/Dnt	Pharm	Nurses	PopDocs	Gm.Prot.	%Anim.	Calories	%Starch	Teach1	Teach2/S	Enrl 1	Enrl 2	Enrl 3	BrthRate	LifeExp.	DepRatio	UrbPop.	Newspapr	Radios	Telephs	Cinema	MtrVhl	LitRate	PCRadio
PCGNP	0.817	0.704	0.788	0.790	0.600	0.104	0.500	0.606	-0.107	0.605	0.704	0.640	0.785	0.640	-0.307	0.606	-0.306	0.617	0.658	0.708	0.806	0.604	0.861	0.306	0.843
Energy		0.881	0.848	0.790	0.648	0.481	0.372	0.670	-0.307	0.306	0.801	0.316	0.616	0.786	-0.306	0.806	-0.106	0.784	0.304	0.690	0.876	0.676	0.806	0.304	0.890
Doc/Dnt			0.912	0.884	0.479	0.446	0.342	0.600	-0.302	0.435	0.876	0.346	0.686	0.760	-0.341	0.602	-0.130	0.861	0.646	0.814	0.930	0.666	0.812	0.362	0.833
Pharm				0.808	0.366	0.479	0.308	0.708	-0.378	0.466	0.846	0.371	0.640	0.730	-0.156	0.607	-0.106	0.712	0.300	0.878	0.873	0.475	0.847	0.353	0.835
Nurses					0.644	0.300	0.431	0.806	-0.374	0.877	0.613	0.878	0.722	0.617	-0.100	0.605		0.806	0.538	0.694	0.867	0.344	0.800	0.400	0.671
PopDocs						-0.080	0.481	0.108	-0.018	0.600	0.484	0.786	0.546	0.868	-0.461	0.376	-0.461	0.614	0.760	0.486	0.646	0.800	0.832	0.380	0.667
Gm.Prot.							0.830	0.406	-0.306	0.067	0.656	-0.686	0.137	0.273	0.117	0.366	0.100	0.411	-0.348	0.108	0.338	0.341	0.608	0.210	0.682
%Anim.								-0.188	-0.088	0.106	0.404	0.300	0.445	0.634	-0.107	0.176	-0.230	0.303	0.609	0.503	0.320	0.271	0.373	0.016	0.426
Calories									-0.017	0.292	0.348	0.236	0.467	0.471	-0.086	0.680	-0.066	0.514	-0.317	0.261	0.710	0.136	0.728	0.336	0.347
%Starch										0.066	-0.340	0.661	-0.350	-0.446	-0.070	-0.084	0.153	-0.230	0.068	-0.304	-0.241	-0.071	-0.218	-0.063	-0.160
Teach 1											0.686	0.876	0.707	0.518	-0.160	0.406	-0.341	0.580	0.800	0.538	0.433	0.500	0.466	0.555	0.762
Teach2/S												0.862	0.018	0.730	-0.204	0.608	-0.176	0.638	0.304	0.730	0.306	0.538	0.086	0.306	0.763
Enrl 1													0.665	0.486	-0.366	0.262	-0.341	0.573	0.468	0.642	0.300	0.618	0.475	0.573	0.856
Enrl 2														0.706	-0.210	0.231	-0.186	0.700	0.431	0.708	0.667	0.368	0.876	0.486	0.778
Enrl 3															-0.306	0.480	-0.348	0.708	0.831	0.647	0.771	0.318	0.830	0.179	0.724
BrthRate																-0.861	0.346	-0.230	-0.361	-0.306	-0.186	-0.066	-0.161	0.070	-0.160
LifeExp																	-0.454	0.441	0.373	0.383	0.613	0.254	0.607	0.166	0.548
DepRatio																		-0.318	-0.360	-0.461	-0.180	-0.058	-0.326	0.123	-0.360
UrbPop																			0.288	0.384	0.756	0.082	0.760	0.310	0.760
Newspapr																				0.870	0.300	0.382	0.463	0.106	0.857
Radios																					0.870	0.446	0.861	0.160	0.849
Telephs																						0.686	0.870	0.348	0.625
Cinema																							0.836	0.440	0.618
MtrVhl																								0.376	0.883
LitRate																									0.284

SOURCE: same as Table 24.

Table 24. Simple Correlation Coefficients for Selected Countries (for the 26 variables analyzed in the regression equations)

1% significance level with n = 112 is 0.239

	Energy	Doc/Inh	Pharm	Nurses	HospBeds	An.Prot.	%Caln.	Calories	%Birth	Teach1	Teach2/3	Enrl 1	Enrl 2	Enrl 3	BrthRate	LifeExp.	DepRatio	UrbPop	Newspapr	Radios	Telephs	Cinema	MorVhl	LitRate	PChecks
GNPPC	0.888	0.780	0.680	0.700	0.880	0.873	0.830	0.718	-0.794	0.456	0.600	0.490	0.780	0.708	-0.780	0.807	-0.800	0.807	0.800	0.819	0.867	0.290	0.804	0.731	0.837
Energy		0.727	0.617	0.790	0.763	0.880	0.786	0.712	-0.718	0.480	0.790	0.404	0.780	0.730	-0.794	0.888	-0.811	0.864	0.780	0.818	0.813	0.194	0.840	0.880	0.867
Doc/Inh			0.790	0.788	0.834	0.788	0.780	0.760	-0.772	0.848	0.816	0.800	0.800	0.781	-0.870	0.814	-0.785	0.732	0.700	0.880	0.805	0.288	0.881	0.848	0.708
Pharm				0.750	0.890	0.813	0.875	0.851	-0.847	0.830	0.748	0.520	0.738	0.731	-0.875	0.824	-0.873	0.836	0.884	0.830	0.900	0.280	0.804	0.741	0.615
Nurses					0.827	0.830	0.761	0.800	-0.713	0.808	0.760	0.580	0.730	0.717	-0.741	0.719	-0.800	0.848	0.776	0.882	0.715	0.280	0.728	0.763	0.884
HospBeds						0.718	0.813	0.765	-0.734	0.586	0.784	0.827	0.780	0.890	-0.887	0.710	-0.781	0.838	0.880	0.813	0.728	0.284	0.751	0.778	0.784
An.Prot.							0.861	0.916	-0.836	0.487	0.880	0.858	0.861	0.816	-0.796	0.861	-0.841	0.861	0.861	0.874	0.887	0.201	0.885	0.883	0.843
%Caln.								0.896	-0.894	0.840	0.780	0.583	0.782	0.890	-0.730	0.730	-0.890	0.700	0.783	0.885	0.720	0.276	0.785	0.780	0.772
Calories									-0.877	0.583	0.880	0.890	0.880	0.887	-0.880	0.748	-0.864	0.880	0.738	0.861	0.843	0.338	0.844	0.709	0.880
%Birth										-0.837	-0.743	-0.580	-0.718	-0.619	0.675	-0.753	0.808	-0.880	-0.883	-0.887	-0.730	-0.314	-0.737	-0.784	-0.708
Teach1											0.580	0.708	0.610	0.803	-0.580	0.736	-0.380	0.808	0.808	0.514	0.344	0.488	0.308	0.706	0.495
Teach2/3												0.580	0.841	0.784	-0.700	0.776	-0.884	0.730	0.700	0.874	0.761	0.306	0.728	0.760	0.801
Enrl 1													0.836	0.490	-0.580	0.716	-0.420	0.808	0.836	0.488	0.373	0.300	0.416	0.737	0.643
Enrl 2														0.780	-0.795	0.808	-0.831	0.700	0.808	0.861	0.738	0.308	0.712	0.807	0.748
Enrl 3															-0.880	0.861	-0.888	0.843	0.817	0.767	0.850	0.361	0.756	0.808	0.716
BrthRate																-0.812	0.880	-0.880	-0.831	-0.610	-0.880	-0.303	-0.843	-0.797	-0.740
LifeExp																	-0.815	0.704	0.767	0.880	0.880	0.483	0.880	0.807	0.864
DepRatio																		-0.610	-0.714	-0.477	-0.373	-0.183	-0.530	-0.840	-0.830
UrbPop																			0.783	0.817	0.804	0.380	0.811	0.743	0.501
Newspapr																				0.880	0.700	0.300	0.730	0.706	0.784
Rad'os																					0.730	0.210	0.736	0.685	0.707
Telephs																						0.300	0.816	0.631	0.671
Cinema																							0.181	0.387	0.186
MorVhl																								0.633	0.561
LitRate																									0.680

SOURCE: Frederick H. Harbison, Joan Maruhnic, and Jane R. Resnick: "Quantitative Analyses of Modernization and Development," Princeton, Princeton University Department of Economics, 1970, P. 120-121, 130-131.

Tables 24 and 25-Continued

1. Economic Development Index: (as a proxy for economic development)

    a. Per capita gross national produce at factor cost (in 1964 U.S.$)
    b. Per capita energy consumption (in kilograms of coal ton equivalents)

2. Cultural Development Index: (as a proxy for modernization)

    a. Newspaper circulation per 1,000 population
    b. Radio receivers per 1,000 population
    c. Telephones in use per 1,000 population
    d. Annual cinema attendance per capita
    e. Passenger cars and commercial vehicles per 1,000 population
    f. Literacy rate of adult population (15 plus)

3. Health Index: (as a proxy for modernization and health development)

    a. Doctors and dentists per 10,000 population
    b. Pharmacists per 10,000 population
    c. Nurses per 10,000 population
    d. Hospital beds per 10,000 population
    e. Daily animal protein as proportion of total grams protein consumed per capita
    f. Daily cereals and starches as proportion of total calories consumed per capita
    g. Life expectancy at birth (in years)

4. Educational Effort Index: (as a proxy for skill and knowledge-generation through formal education)

    a. First-level enrollment (adjusted for 5-14 population and average duration of school)
    b. Second-level enrollment (adjusted for 15-19 population and average duration of school)
    c. Third-level enrollment (adjusted for 202-24 population and average duration of school)
    d. Per capita public recurrent expenditures on education (in U.S.$)

5. High Level Manpower Index: (as a proxy for stock of persons with strategic skills and knowledge)

    a. Doctors and dentists per 10,000 population
    b. Pharmacists per 10,000 population
    c. Nurses per 10,000 population
    d. First-level teachers per 10,000 population
    e. Second- and third-level teachers per 10,000 population

6. High Level Manpower Stock/Flow Index: (as a proxy for stock and generating capacity for strategic skills and knowledge)

    a. Doctors and dentists per 10,000 population
    b. Pharmacists per 10,000 population
    c. Second- and third-level teachers per 10,000 population
    d. Proportion of third-level enrollment in agricultural courses
    e. Proportion of third-level enrollment in medical courses
    f. Proportion of third-level enrollment in science and engineering courses

7. Demographic Index:

    a. Number of births per 1,000 population
    b. Number of deaths per 1,000 population
    c. Life expectancy at birth (in years)
    d. Dependency ratio (0-14 and 65 plus population as percent of 15-64 population)

8. Composite Index: (as a proxy to serve as an overall view of development and modernization)

    a. Including most but not all of the preceding indicators plus
    b. Percent of population living in cities of 20,000 and over.

Tables 24 and 25-Continued

Using data from the 112 country-40 variable synchronic matrix, the eight indices were calculated for the following country groups:

a. Latin America (24 countries)
b. Asia (16 countries)
c. Middle East/North Africa (11 countries)
d. Sub-Sahara Africa (31 countries)
e. Developed countries (30 countries)
f. The aggregate group of 112 countries

level information. With this much of the diagram filled in, let us turn to village-or district level study, for this is the level at which many development programs actually do their work.

VILLAGE-DISTRICT LEVEL MEASUREMENT OF DIFFERENTIATION

Measurement of social welfare is frequently conducted on a household level and on the national level. It is rarely conducted on the district-village level. However, it is on the district-village level that most development programs are carried out. The most frequent question put to researchers in developing countries is whether an area that has been given a development project--irrigation, a rural credit scheme, cooperatives, a new factory--is any better off than it was before, or is any better off than other areas that have had different development programs or no program at all. Therefore efficient measures that would compare one whole area with another--be it a village, a larger district or a whole region--would be extremely useful.

I am going to argue that in principle it is possible to measure social welfare at the village-district level to a degree of accuracy such that these measures would be closely related to measures aggregated from household information. If it is possible to do this at the national level, it is possible at the village-district level. Such measurements have not yet been fully developed but many standard research operations at this level would serve as components.

Differentiation may be considered a measure of the development of the village-district, and from measures of differentiation comes the idea that food supplies may also be studied at the village-district level through measures based on the retail marketing system.

The differentiation of a village or district refers to the specialization and diversity of its development, especially the complexity and diversity of its institutions. Differentiation is often related to population size, but villages of the same size may have very different levels of differentiation from country to country or from region to region. Differentiation has been measured in various ways, but frequently by a Guttman scale in which most of the village institutions are included: commercial, governmental, educational, social. Such scales have been devised for many parts of Latin America, in several countries of Asia, in the United States, and in several African countries.

Information needed in devising measures of differentiation can come from a number of sources. It can come from a Census of Business; some censuses already provide much of the necessary information. It can be collected by sending an observer with a data collection schedule through a village-district noting all of the institutions, different types and numbers of business, schools, health facilities, clubs, political institutions, churches, etc. It can be done by interviewing one or more key informants, persons often in some official position but at least persons who know the community well and asking them about the institutions. Interviewing can provide information also on what changes have taken place, what institutions have been added and what ones disappeared in recent years. Information on the past history of institutions in a recent period that informants provide has been found to be reliable and can provide a basis for the study of change.

Tables 26 and 27 show two differentiation scales. The first was devised for 24 Mexican villages and includes a wide variety of items. The second was devised to measure the differentiation of 30 communities in Kenya. Both contain a variety of institutions from all sectors, and this is usually the case.

A similar scale was developed in a study of 118 communities in southwestern Puerto Rico. It is shown in Table 28. In this case a number of other measures of differentiation were also developed (Young and Young 1973). One of these was a scale that included the different types of forms found on the village plaza, an institution common to communities in many Spanish-speaking countries. Another scale was based on the elaboration of the annual village fiesta. Another reflected the complexity of the settlement pattern, including such items as different street and road patterns, different residential sections, a plaza, roads entering and becoming part of the street system, and a housing project. Other measures consisted of counts of grocery stores, churches and primary schools. In other studies counts have been made of all of the retail stores lumped together. Still others have concentrated on the elaboration of health facilities and medical specialties. Table 29 shows the relation of the various measures used in the Puerto Rican study. These are all highly related to each other and the general finding is that various types of measures of differentiation, whether they include all institutions or confine themselves to a single institutional sector tend to be closely related and may be considered measures of a single concept, the level of development or differentiation of a community.

Table 26. Guttman Scale of Differentiation for 24 Mexican Villages (Young and Young, 1960b)

Step Number	Item Content	Proportion Discriminated
1	Named and autonomous locality group	1.00
2	One or more governmentally designated officals More than one street	.92
3	One or more organizations in village	.88
4	A church	.84
5	A school building A government organization An ejido Mass said in the village more than annually	.80
6	A functional school	.76
7	Has access to a railroad or informant voluntarily includes railroad in list of village needs	.63
8	Access to electric power Informant estimates that a majority have electricity Six or more streets	.46
9	Railroad station Four or more bus or train trips daily	.41
10	School has four or more grades	.37
11	Village has a public square Village market patronized by people in other villages	.29
12	Doctor Priest resides in village Ten or more streets School has six or more grades Six or more stores Two or more television sets in village Public monument	.20
13	Has one or more telephones	.16
14	Forty percent or more have radios Settlement area one square mile or more	.12
15	Secondary school Twenty or more stores	.08

Coefficient of scalability is .92.

SOURCES: From Frank W. Young and Ruth C. Young: "Comparative Studies of Community Growth," Rural Sociological Society Monograph No. 2, West Virginia University, 1973, p. 24.

Table 27. Scale of Community Differentiation, Kenya 1962-68

Step	Item	Error	Percent Sample Discriminated
1	Village has tea shop Alternatives: Has chief's office Tailor Health centre More than one denomination Primary school	0	100
2	Village has over 5 dukas (stores) Alternatives: Has a butcher Has a shoemaker	2	97
3	Village has an agricultural assistant	3	93
4	Village has wood cutting and charcoal burning	2	87
5	Has farmer training recorded attendance	1	76
6	Has a barber	5	66
7	Has a beer bar	3	53
8	Has a blacksmith	5	50
9	Has Kenya Farmers' Association services	4	36
10	Has mobile banking services	3	20

Number of cases - 30 villages

Coefficient of scalability - .68

SOURCE: Philip Mbithi: "Rural Level of Living and Farm Development in Eastern Kenya: A Uni-Dimensional Approach," Unpublished M.S. thesis, Cornell University, 1969, p. 38.

Table 28. Scale of Local Commercial Differentiation in 118 Puerto Rican Communities, 1966

Step Number	Item Content	Proportion Discriminated	Number of Errors
1	Convenience grocery store	1.00	
2	At least one other specialized commerical	.46	0
3	Gas station	.20	3
4	Barber shop	.13	5
5	a. Butcher	.12	1
	b. Wholesale store		5
6	Beauty shop	.10	1
7	Hotel or guest house	.09	1
8	a. Cafe	.08	6
	b. Medium-sized grocery store		4
	c. Bakery		1
9	a. Clothing store specializing in women's clothes	.06	3
	b. Movie theater		0

Coefficient of scalability is .71.
Coefficient of reproducibility is .95.

SOURCE: Frank W. Young and Ruth C. Young: "Comparative Studies of Community Growth," Rural Sociological Society Monograph No. 2, West Virginia University, 1973.

Table 29. Zero Order Correlations Among Community Differentiation Measures and Multiple Correlations Between the Measure and the Rest in 118 Puerto Rican Communities

Variables	1	2	3	4	5	6	7	R*
1. Fiesta scale		74	68	60	66	46	75	61
2. Commercial differentiation scale			79	72	80	60	87	79
3. Settlement pattern scale				80	76	60	83	76
4. Number of churches					82	69	80	76
5. Number of grocery stores						79	85	85
6. Number of primary schools							66	64
7. Plaza scale								85

* This column shows the multiple correlations (R) of each of the variables listed with all the rest. It is included in the table as a summary measure of the rows, and aids the assessment of the overall relationship.

SOURCE: same as Table 28.

There are a number of advantages in studying community differentiation. The obvious one is that it describes much of the organizational life of the community and provides a framework for understanding the institutions and services and their physical manifestations in their totality. It provides a basis for studying changes in the social organization of the community over time. Has institutional complexity increased more or less than the population? How does its progress compare with other communities in the area? Where do new organizations or institutions fit? Where does change take place? Such study also provides the basis for examining the structure of the larger area, the province or state. Is the area mainly served by one very large, primate community and a lot of small hamlets, or is there a hierarchy of communities? When change takes place in the area, how is this structure affected? Do new power centers arise, are there shifts in relative differentiation of communities in the area, does the organization of the area become more hierarchical or more centralized?

These are examples of the kinds of questions that can be examined in the course of such a study that provide understanding of structure and change needed for policy assessment. Development projects frequently mean the introduction of new institutions, such as credit banks, cooperatives, extension organizations, fertilizer stores etc. Where do they go, where are they needed in order to service an area, how differentiated must a community be to provide support for a new institutional unit, or in what communities do they survive? How do such new institutions, and the physical and political links with the outside that they provide, shift the patterns of influence among communities in the area?

The study of village-district differentiation provides another way of looking at individual development. One can do this by looking at the level of living of individual households, including purchase of household objects, housing characteristics, educational attainment, participation in health, government and social organizations. But another way of examining the level of individual differentiation of one area compared with another is by looking at the level of differentiation per capita. Is the level of differentiation greater per unit of population in Village A or Village B. Whether you look at a mountain from the top down or the bottom up it is the same mountain. Some studies have examined the relation of village differentiation to individual differentiation, and have found that more differentiated villages tend to have more differentiated families. Since the families are part of the village social organization and must receive ideas, goods, services, practices and habits through its institutions, this makes good sense. Further study of these relations would be very useful, so that the effect of regional development projects on regions would be better understood and their effect, on families through village institutions, better evaluated. This type of study provides a look at the regional and village institutional base from which family progress flows. It means the study of social welfare at the social system level on which social programs customarily operate.

Differentiation scores assigned villages on the basis of their differentiation scale steps have been shown by experience to indicate what villages are likely to get new institutions or programs first. A new item may go to few or to many communities, but the more differentiated will normally get it first. When this is not the case, when some relatively undifferentiated village suddenly acquires a number of new institutions, this is a special case that upon examination usually indicates interesting shifts in regional structure. For example if a less differentiated community happens to be located on a new highway or railroad line, or is located in a region strategic for some new development, such as tourism, irrigation or mining it will enjoy a sudden leap in differentiation. This rising of a new center will inaugurate many shifts of relations among the people and communities of a region that need to be examined for social planning.

It is normally assumed that a community is highly differentiated or has many institutions and businesses because it serves many people. But the reverse hypothesis is just as plausible. A highly differentiated center with many institutions and services attracts population. We know that this is true in some areas through studies of inter-city migration. New types of transportation, new political divisions or alignments, new economic institutions, new ethnic groups can lead to shifts in community differentiation in a region. Such shifts can be understood graphically in a study of the differentiation of the communities of an area and their changing relations to each other. Such a study indicates which communities have developed and what this has meant for all of the others. With this general framework of differentiation, let us look at it from the point of view of what it tells us about food supplies.

VILLAGE DISTRICT FOOD SUPPLIES

An important ingredient of the study of village-district differentiation is the study of the retail system. This is the beginning of a study of food supplies available to the village. One might argue that a study of food supplies at this intermediate level might be more readily obtained, more accurate and freer from respondent bias than measures based on household interviews, and especially among poor, rural people. Let us consider what else would be needed in order to measure food supplies available to a village-district.

First, we would need to have some estimate of what is raised in the area. For the commercial crops, such estimates probably already exist in many places and are compiled for other national purposes. If not, for commercial crops information could be gleaned from those who process and transport these crops for the market. Amounts of commercial food crops kept for home use must be related to amounts sent to market and could be estimated from these. Other methods could be developed, such as field sampling, aerial photographs, and the like.

In many areas even if the crop raised commercially is a food crop that is used for family consumption, such as rice, much that is important for family nutrition must be bought. Many studies of retail marketing systems have been conducted by agricultural economists. These yield information about all the different types of retailers and what they sell. These may include street vendors, open markets, small shops, supermarkets, and the like. One such example is a study made by a University of Michigan group in the Northeast Brazil (Slater, et.al., 1969) the poorest, least developed area of Brazil. The same group has made similar studies in a number of other Latin American countries. The research team carried on a series of exploratory interviews with participants in the marketing system. From these they developed questions that were put into a series of systematic schedules administered to all kinds of retailers: fair stall operators, fixed fair operators, public market operators, neighborhood stores, supermarkets, consumer cooperatives and large meat dealers. Table 30 gives the percent of different types of retailers that carry different commodities. This table (along with many others) was developed from the retailer survey schedules. It is clear that such information could be elaborated according to the interests of the researcher. In other studies of this series detailed estimates of quantities sold and prices were obtained. In the case of open-air markets, sufficient information might be gained by observation count, and various types of crude measurements of commodities on sale. If this were validated at first with interview information, it might provide a useful shortcut.

In addition to providing information on the variety and quantity of food on sale, a study of the retailing system could yield much direct evidence on the whole class structure of the community. If we know what types of people purchase food in what types of outlets, the number, variety, physical distribution, and quantity of sales in different types of outlets could give us a quick picture of the class structure of a community--how much is sold in lower-class outlets, as compared with upper, how much in urban areas as compared with rural. Gradually marketing studies could be refined so that measures of key commodities might stand for the whole system. For instance if we know the distribution of meat, fish, milk, eggs--animal protein--we might find that this is closely related to the distribution of fruits, vegetables, starches, and to all foods. But it would be much easier and more economical to gather information on only two or three key types of foods. These might turn out to be beans, rice, citrus, or whatever. What we would be looking for would be some food, the distribution of which is closely related to the distribution of all foods.

In addition to studying farm production figures and the retail market system, there is one other type of study that has been conducted to gather information about food supplies. In a study in Ghana, Poleman (1961) describes how he conducts what he calls the Produce Movement Census and tells why he thinks this is a good way of measuring food supplies. To conduct this census, road checking stations are set up on all the ingress and egress roads around the study area. Every truck coming in or leaving is stopped and reports what it contains. From this census, food supplies of the area are estimated. Poleman advocates doing this over a long period of time, but obviously experimentation would provide a basis for sampling here as in any other type of data-gathering operation. This may mean sampling on different days, times, and particularly seasons of the year. Poleman states that many countries conduct such road checks already for other purposes and that these could be utilized to estimate food supplies.

Let me summarize. The village-district level is an important one in action programs. We may wish to know how one compares with others, or whether one has made progress in social welfare over time. General measures of village differentiation have been worked out in many places and relate to aggregated measures of family differentiation in these

Table 30. Percent of Retailers by Type Carrying Various Commodities in Northeast Brazil

Commodity	Street Fair	Fixed Fair	Public Market	Neighbor-hood Retailers	Self-Service Retailers
Rice	10%	13%	16%	50%	98%
Beans	11	13	16	51	95
Manioc Flour	15	13	16	52	95
Liquid Milk	--	--	--	5	7
Dairy Products*	--	3	--	34	81
Fresh Beef	6	13	27	6	7
Other Meat	15	11	10	37	81
Poultry	4	5	4	3	40
Eggs	--	NA	NA	47	50
Bananas	11	54	39	32	12
Other Fruits	34	54	39	32	12
Tomatoes	11	54	39	16	12
Other Vegetables	38	54	39	22	12
Canned Foods	5	--	--	39	100
Other	12	1	4	34	--

* Excluding liquid milk.

SOURCE: Charles C. Slater et al: "Market Processes in the Recife Area of Northeast Brazil," Research Report No. 2, Latin American Studies Center, Michigan State University, 1969, p. 5-15.

same areas. These general differentiation studies have contained enumeration of the retail trade systems. Such studies could be elaborated to provide information on the quantity and variety of food sold. Agricultural economists have conducted detailed studies of retail marketing systems yielding such information, and these could be elaborated. Additional information could be added from estimates of local crop production, and from the product movement census of food going into and coming out of an area. Systematic study could lead to sampling procedures that would reduce the amount of work needed, and gradually several commodities could be found that would tell much about the food supply system as a whole. At that stage, such a study would provide quick, economical and systematic measures of village welfare that could be used to monitor welfare over time and from area to area.

My main purpose is to discuss social indicators. But I would like to point out that studies of retail marketing systems and food supply distribution are valuable in their own right. In many countries such food supplies as exist are very poorly distributed. A surplus of fruit might lie on the ground rotting in one area, and an acute shortage of fruit might exist in another area because of the lack of any adequate transportation or marketing system. Such studies also provide the basis for the study of the village-district and regional economy, and it is for such reasons that they have been typically used in the past. Therefore such studies would be useful apart from serving purposes of monitoring social welfare. For the latter purpose, my general argument is that most people in the world are part of a cash economy. Therefore much of what they possess in the household has to be bought. One can either measure a commodity by counting the supply in each of 100 households, or in store from which each of the 100 households has made it purchases. The latter route makes much sense for efficient social monitoring.

In Chapter 1 a list of social welfare indicators collected by David Smith on the 48 United States (excluding Hawaii and Alaska) was presented. Smith performed a factor analysis on these measures and showed (Table 31) that diet was a part of a larger social welfare factor. This factor included measures of affluence, health, education, housing, voting along with diet. That is, food is part of and could, if well measured, stand for other regional measures of social welfare. This provides another link between food and general welfare measures. We do not have a link between all of the cells in Diagram 1, but we have them between the village-district measures of food and other welfare measures, and between village-district measure of general differentiation and family level measures of differentiation.

We have now gone over all of the cells in Figure 1 and have discussed how each of these cells can be measured. We have discussed food at the national, district-village, and family levels. We have discussed national development, village-district differentiation, and family differentiation or welfare. Any of these cells can be a research focus in its own right for all kinds of applied or theoretical reasons, and indeed has been so. But the links between the different measures at each level are important; for if food is closely related to other measures of welfare at each level, this means that food could stand as a measure of social welfare at each or all levels. If measures of food or general differentiation at each level tend to be related to measures of the same thing aggregated at lower-system levels, this means that social welfare (or food) can be studied at any level that is efficient and relevant and related to measures at the higher or lower system level. In some cases the district-village may be of more interest than individual families. In other cases the interest may be in family welfare programs, but it may be possible to evaluate the general success or failure of such a program by measuring the welfare of a whole village or district at which such a family program has been targeted, because of greater cost and time efficiency. These sets of linkages within and between levels provide more flexibility in the measurement of social welfare depending on interests and resources available. But they also provide the possibility of studying one element central to welfare, food supplies, at all three system levels in order to gain better understanding of how the family, village, and national systems are linked together, to understand the distribution of food as a complete social, economic and political process. Understanding of how food production and distribution works from the family to the national level would be valuable for its own sake, and would reveal much about these social systems in a more general way, and particularly the processes and exchange mechanisms linking them together. Therefore the study of any of these sets of links could also be valuable in that respect.

In the last section we will discuss some general research questions that underlie all of these various research possibilities.

Table 31. Structure of the Three Leading Components of Social Well-Being at the State Level in 48 United States

COMPONENT 1:		GENERAL SOCIO-ECONOMIC WELL-BEING (explained variance: 38.56%)
highest loadings:	-.9398	families with income less than $3000
	-.9083	houses dilapidated etc.
	.8951	benefits for retired workers
	.8853	per capita income
	.8951	dentists/10,000 population
	.8556	AFDC payments
	.8086	state unemployment benefit
	.8065	value of owner-occupied houses
	-.7993	households with poor diets
	-.7993	infant deaths
	.7868	public school expenditures
	-.7834	mental test failures
	.7780	eligible voters voting
	.7749	white-collar employees
	.7615	physicians/10,000 population
	.7587	median school years completed
COMPONENT 2:		SOCIAL PATHOLOGY (explained variance: 13.74%)
highest loadings:	.8384	crimes of violence
	.7236	syphilis cases
	.6719	gonorrhea cases
	.6528	narcotics addicts
	.6422	school segregation
	-.6325	registered voters
	.6043	crimes against property
	.5517	illiteracy
	.5413	tuberculosis deaths
	-.5329	index of home equipment
COMPONENT 3:		MENTAL HEALTH (explained variance: 11.98%)
highest loadings:	-.8174	patient days in mental hospitals
	.7999	hospital expenses/patient day
	-.7940	residents in mental hospitals etc.
	-.7800	hospital beds/10,000 population
	.6323	divorces
	.5583	suicides
	.4932	mental hospital expenditures/patient days
	.4696	motor vehicle accident deaths
	.4601	crimes against property
	.4568	median school years completed
	.4548	persons attended college

SOURCE: Taken from David M. Smith: "The Geography of Social Well-Being in the United States," New York: McGraw Hill Book Co., p. 94.

SOME GENERAL PROBLEMS OF INDICATOR RESEARCH

The last section will deal briefly with four general problems of indicator research: the general problem of social measurement; social monitoring; evaluation research; and causes of social well-being.

In social research, no one measure is ever perfect. Unlike ears of corn or pigs, human beings are endlessly variable and many different influences impinge on everything they do or say. Therefore no single item used to measure food supply or health is likely to measure that alone, uncontaminated by any other influence. Therefore, we like to use a series of measures that are all closely related. But to use each one alone still leaves us with the problem of which one is best. And it also gives us the problem of very voluminous, cumbersome research. Therefore many sociologists use a number of ways to simplify this problem. We start with a series of measures--it may be 5, 10 or 50--of some general concept we are interested in, such as level of living, food supply, family health. Then we use any of a number of techniques, some of which we have already discussed, to reduce these to one good measure. In this way we feel we have eliminated some of the idiosyncratic variation that might be present in any single item and have a stronger, more valid measure of the concept. I have mentioned various types of scales as ways of dealing with this problem. The first, was the type of scale used in the level of living study, in which each item was correlated either with some outside validator or with a total score of all items. If each item is numerical, one might use a correlation coefficient of some sort, or if qualitative (non-numerical) some non-parametric measure of association. Then one would discard items that do not relate very much to this criterion, and add the rest into a score for each case.

Another type of scale found useful for qualitiative or non-numerical data is the Guttman type of cumulative scale. The appendix by Schlegel (1974), describes what this scale is and how to do. For best results, do the work by hand. There are computer programs for Guttman scales, but no matter what method of evaluation you choose, you are in a better position to understand why an item is working or not working if you do the work by hand and look at it and think about it. In this way you will also have a chance to look at what appear to be deviant cases. Suppose you are trying to make up a personal clothing scale. You may look at a case that simply does not seem to fit the scale at all and find that the person is a nun or an army officer or a restaurant waitress whose clothing needs are systematically different than the normal person's. You may decide such a case is not a legitimate part of the population you wish to study, and exclude it from consideration in making up the scale. In making up scales, as in all social research, the more familiar you are with every aspect of your data, the more likely you are to succeed. In the ideal case, what comes out of the computer or what is handed to you by a clerk should only confirm what you know already because you have been involved with your data and understand what is going on. If you have a large sample or population, draw a subsample and work with it in the preliminary stages of analysis.

Let us take another example. You may look at two items and see that most people who have one article, such as a raincoat, do not seem to own an umbrella and vice-versa. Then you can say that either one seems to act as a substitute for the other and make up a new item, person owns a raincoat or an umbrella. The computer would not tell you this. You would have to examine the data closely and look for such regularities.

Another way of condensing related items into a single measure in the case of quantitative material is the factor analysis. This is probably too time-consuming without a computer, but very simple with one. Even if you do most of your analysis yourself by hand or with the aid only of a calculating machine, it might be efficient to take a segment of it to an available computer at some distance away to condense your data into a series of simpler measures by factor analysis or some such method. Then the factor score could be taken back home and used in non-computer methods of analysis much more easily.

Let me emphasize again that I am not suggesting you simply take a large pool of items of any sort and look to see if you can find some related set to condense into a single measure to which you will then assign a name. I am suggesting that you must start with a clear idea that makes sense to you and other people of what concept you want to measure, find a number of items that might measure this concept, then condense all of these into one better measure by some method of scaling or factor analysis, at the same time eliminating other items that do not work well.

Another problem to which to sensitize one's self to is looking at items from the point of view of what part of the population they might be measuring well. For example in a level of living scale, you might find that having a car discriminates the very rich from all of the rest but does not tell you the difference between an upper-middle-class family and a working-class family. You might find some item that everyone but the very poor have; this will do a good job of telling you who the very poor are, but will not distinguish the rest from each other. Different types of measures and different types of scales must be evaluated not only in an overall way from general criteria of adequacy, but from the point of view of whether they really separate from each other the part of the population that is the main focus of research, whether these are very poor, very rich or some other group.

A second problem I will mention is that of social monitoring. By social monitoring I mean the taking of the same measure at regular intervals in time over a large population of people or villages. The census of population, the census of agriculture, the census of business, tax records, land ownership records, birth and death records can all be used for such purposes. The ideal research design compares at least two points in time and compares at least two groups at each point in time. Such a simple research design might work well for an experiment in feeding pigs or testing fertilizer. In the human world generally speaking much more is needed. You may need to compare many groups over several periods in time before you can tell whether any one group or any one time period is really different from all the rest. Therefore you can multiply the effectiveness of your research tenfold if you can find even a few measures that are important to client groups and monitor them over a wide area and repeatedly over a long time. In talking of social indicators the ideal would be to work out some good measures that yield the kind of social data that planners, developers, administrators, legislators need. Ideally the census office or some central data-gathering office will incorporate these into its efforts. Censuses have been developed to serve particular purposes--demography, tax purposes, voting, economic prediction, public health organization, and the like. Social scientists primarily interested in human social welfare have not typically had a strong influence on census material up to now. But for future efforts in the monitoring of social welfare, influence on census bureaus to gather some well-worked out measures is clearly in order.

In Israel, Louis Guttman was the leader of a research group that wanted to do research that would be useful to government agencies in their regular operations. But his group found it very difficult to respond to agency questions in time for the research the group did to be of any practical use. Starting from scratch the research took too long. Therefore, they initiated a system of social monitoring including in a survey administered at regular intervals to a sample of the whole population a set of core questions that they decided were of lasting value and relevance. From time to time, they would add other special questions or questions of temporary value. If research is done at regularly planned intervals, then when social questions arise, chances are good that they can be fitted into the regular schedule already in the field or about to be sent, and answers are secured in much less time than it would otherwise take. It is only by such regular and systematic work that this group was able to be responsive to government planning needs for information. A core set of well-worked out social indicators can provide a basis for such social monitoring. Depending on the country, additional sets of questions on topics that seem to be important over long periods of time can also be developed. One such topic obviously would be agricultural production for farmers. If a country wished to evaluate a cooperative program a great part of its work would already be done if it had regular information on production and on social welfare at regular intervals and going back a number of years. One could then compare cooperative areas with others to see if the trends in such areas were different from the non-cooperative areas in respect to these two fundamental sets of variables. It is only a system of social monitoring that is likely to provide such a baseline in most areas of the world. Similarly, in planning a new program, regular social monitoring provides a much sounder basis for selecting target areas or populations than a special study launched for the purpose. The measures have been well-worked and tested over time, and they are ready in sufficiently short a time to be of some use to a planner. Furthermore, if the government officials who make decisions have been accustomed to receiving information about these measures on a regular basis, they are already familiar with them and communication problems are decreased, as compared to communicating new research to lay people.

This leads us to the topic of social indicators as evaluation research. A program can be evaluated in terms of its own goals: did it set up the organization it intended to and employ the required personnel, did it spend and distribute its funds properly, did it build buildings, or dams, did it reach its client group, etc.? Did it do all this efficiently? But after all these questions are answered, the researcher is still left with the fundamental question of whether the program may do everything it intended to well and efficiently, and still not improve production or raise the level of living. This, we might say, is the case where the operation was a success but the patient died. Or the converse may be true; a program may not do its job well, but other social forces may have improved life in this and other areas. Therefore, no matter how else a project is evaluated, it must eventually face up to the question of whether life has improved for the people involved and for other people indirectly touched by the program more than it otherwise would have without the program. Therefore, social indicators research, whether especially carried out to evaluate a particular program or part of a general social monitoring, must be the final step in any evaluation. The target group must be compared with others over a wide area in this fundamental respect. To find out whether it was worth doing, we need to find out whether the target group improved any more than untreated areas, or any more than normal social trends would have accomplished in any case. A program that has not raised the level of living may say that that is not what it intended to do, that its purpose was to provide hydroelectric power, or a dam or a high school. Then the planner is faced with asking when this program can be expected to improve things, for whom and how. Many large projects have turned out to be white elephants that are impressive things in themselves but which have not improved anyone's life a bit. Therefore if a project purports to have indirect or long-range effects, evaluation by the use of social indicators would have the effect of compelling it to spell out what these indirect or long-range effects are supposed to be, what they would cost, and the administrator or planner could then compare the expected results with those of other programs.

This is often the government's problem. It is not trying to decide whether to have cooperatives or not, whether to build a hydroelectric project or not, whether to build an industry or not. Rather the problem for a government is which of these to put its effort and money into. Comparing such programs is like comparing giraffes to fleas, or apples to bread, if one evaluates each in its own terms. But there is a common set of terms in which one can evaluate all of them, namely how much each improves social welfare, in what span of time, for what populations and at what cost. Therefore, for many practical questions, social indicators provide the only possible form of evaluation.

The last problem that I want to touch on lightly is the problem of causes and treatment of poverty. The lay person's response and often the government official or legislator's response to poverty is to think in terms of, "They are hungry, hand out food stamps," or "Infant mortality is high, let's build a clinic." This approach seems like common sense, but we may compare it to a symptomatic treatment of disease. In the case of illness, we like to treat whatever causes the disease rather than merely alleviate its symptoms. In the case of poverty, then, to make any real change we need to analyze what about the social structure causes unemployment or underemployment, what about the agricultural structure prevents farmers from making a living and alter these structures to make poeple self-sufficient.

From this point of view it is useful to look at some definitions of poverty. Reissman (1973) offers three definitions of poverty: (1) poverty as income; (2) poverty as culture; (3) poverty as social class. If poverty is defined in terms of how much income a person has, one is faced with setting the amount of income below which people are considered poor. Reissman points out that this changes from place to place and time to time and in terms of changing ideas and standards of what people ought to have. If these problems can be overcome, income, he says, can be used as a yardstick to measure poverty. But he points out that increasing income in order to solve the poverty problem does not solve the problem at all.

"My response to this view (i.e., that the solution of poverty lies in getting more money into the hands of the poor) is that its proponents usually interpret income in such a limited fashion that their 'solution' to the problem is hardly a 'solution' at all. For one thing, unless increased economic opportunities are provided along with the increased income, there is likely to be very little effective change in the situation for the poor. Added income does little more to solve problems than do current welfare payments.

"Second, unless there is more widely effective access for social participation, then income alone cannot help to remedy even the economic consequences of poverty . . . .

"Finally, unless income differences are interpreted as signs of the larger condition of inequality, then the minor tampering with strictly income solutions misses the need for a significant form of income redistribution that can be more lasting." (pp. 47-48)

He argues that increases in income do not necessarily provide freedom of choice in its use, increased participation, increased access to economic opportunity or greater control of one's life.

He also rejects another popular conception of poverty as a special culture. Oscar Lewis introduced this idea in his work on poor Mexicans and Puerto Ricans. But Reissman points out that poverty is not a self-contained culture or a culture that is chosen by the participants, one that they are free to reject. It is a culture circumscribed or determined by the larger society of which it is part and it is very difficult to leave. Thus it is not really what we ordinarily mean by a culture.

He favors a third definition, poverty as social class. In defining poverty as social class he says that it is thereby defined as "an inescapable feature of social inequality. The poor belong to the lowest stratum of the American class structure. They lack any effective access to social, political and economic institutions--a situation which makes the poor virtually powerless to challenge or to control their environment. This condition is further compounded by the inability of the poor to organize themselves into a coherent and conscious class that might pursue power. In addition, it is quite likely that the poor judge themselves by the current standards of the society-at-large as failures or the victims of bad luck." (pp. 52-53)

He goes to say that there are two ways of distinguishing the lower class: (1) the conditions of their existence--their housing, diet, economic goods, occupation, education, etc.; (2) the situation that establishes the extent of access to society's rewards and benefits. It is the first way that we have been discussing in this and previous sessions in terms of measurement. In terms of solving the problem of poverty it is to the second that we must look.

In the factor analysis of social welfare in the 48 United States performed by David Smith (1960), he arrived at two factors, general socioeconomic well-being and social pathology. Young and MacCannell (1975 mimeographed) tried to find out what kinds of economic, social and political structures caused differences in socioeconomic well-being and in social pathology among the 48 United States. The usual hypotheses are that differentiation, urbanization, industrialization or increases in any of these lead to better social welfare. Young and MacCannell also had a different hypothesis that social or political rigidity led to low social welfare. What social and political rigidity meant in this case was states with a centralized, stagnant political system where one party had been in power for a long time; a caste system where in these same states there were laws depriving people of social, economic and political opportunity because of race. They had a number of measures of each of these concepts on which they performed a factor analysis to reduce them to the factors you see in Table 32. Table 33 shows that the factor that has the greatest influence on socioeconomic well-being is the flexibility-rigidity factor. Differentiation, industrialization, and increased urbanization had some but far less effect. This might be interpreted as telling us that no matter how much you urbanize, industrialize, differentiate your society, advances in these areas are of no use to people who have no access to them. Therefore, in American society the main problem at the moment is the integration of deprived population elements into the mainstream of economic progress. If we increase the whole cake, as it is often put, it does not necessarily mean that everybody is going to get a bigger share of it, unless we reorganize methods of giving out shares. In other societies there are similar barriers; peasants may lack land or access to means of production. Or if they have inputs and a small piece of land, processing, marketing and exporting may be in the hands of a class that deprives the agricultural producers of access to profits. In order to cure poverty, this theory implies that it is necessary to make whatever structural transformations will give deprived groups access to economic, social and political opportunity. These transformations usually will not be performed by small improvements to the technology or even redividing the land unless these are accompanied by profound changes in the whole economic and political structure so that deprived sectors have access to economic and political participation in such a way that they get control of their own lives.

Table 32. Varimax Rotated Principal Components Analysis of Attributes of State Political, Economic, and Social Structure (N-48) in the United States

	Factor Loadings				
	1. Differentiation	2. Flexibility-Rigidity	3. Progressive Industrialization	4. Population Change-Urbanization	Communality - R^2
Differentiation Scale	.79	.06	.08	.01	.63
Population Size	.97	-.11	.12	.10	.97
Number of Engineers	.92	.07	.17	.27	.95
Number Workers in Manufacture of Durable Goods	.90	.16	.21	.11	.88
No. Workers in Manufacture Non-Durable Goods	.90	-.13	.33	-.01	.95
No. 500 Largest Corporations in State	.87	.24	.23	.09	.88
No. of 50 Largest Banks	.91	.12	.12	.16	.88
Value added to Manufactures	.94	.05	.29	.08	.98
No. plants employing 100 or more persons	.92	-.03	.36	.01	.98
Political Competitiveness Scale	-.00	.85	.03	.30	.81
Flexibility-Rigidity Scale	.31	.88	.11	.14	.90
Per Cent Voting for Humphrey 1968	.15	.78	.44	.02	.83
Per Cent Voting for Wallace 1968	.04	-.94	-.10	.06	.90
Per Cent Negro	.17	-.92	.12	.03	.90
Number of patents per 10,000 workers, 1900-1950	.35	.51	.51	.46	.86
Proportion of the labor force in manufacturing	.37	.05	.84	-.12	.86
Population density	.34	.08	.86	.12	.88
Per cent of labor force employed in rapidly growing industries	.33	.45	.64	.45	.93
Per cent population change	.02	.02	-.07	.95	.90
Per cent of population urban	.43	.29	.34	.71	.89
Cumulative per cent of variance explained by unrotated matrix	51.9	74.0	81.8	88.8	
Eigenvalue	10.4	4.4	1.5	1.4	

SOURCE: Ruth C. Young and Dean MacCannell: "Predicting the Quality of Life in the United States," Cornell University, 1975. (mimeographed).

Table 33. Regression Coefficients - Dependent Variable: Smith's Factor 1--General Socio-Economic Well-Being in the United States

Factor	b Regression Coefficient	beta Standardized Regression Coefficient	Standard Error of Regression Coefficient	F Score
	Using Factor Scores to Explain			
1. Differentiation	95.96	.22	19.83	23.41
2. Flexibility	353.39	.82	19.83	317.59
3. Progressive Industrialization	76.58	.18	19.83	14.91
4. Population Change	166.70	.39	19.83	70.67
	Constant .187			
Attribute	Adjusted R^2 .90			
	F Ratio 106.65			
	Using Selected Variables to Explain			
1. Population size	0.10	.21	.04	6.15
2. Per cent Negro	-37.31	-.77	3.61	106.92
3. Population density	6.62	.32	1.63	16.44
4. Population change	22.43	.30	5.29	17.95
	Constant -266.84			
Attribute	Adjusted R^2 .76			
	F Ratio 38.15			

SOURCE: See Table 32.

APPENDIX
GUTTMAN SCALES AND GUTTMAN SCALING

Guttman scaling is a means of transforming qualitative data into an ordinal numerical scale. Although not necessarily limited to dichotomous (two-category) items, these are the most commonly used in practice, and attention here will be restricted to them. In more formal terms, a Guttman scale is a method for testing whether a series of qualitative items belong in a single dimension. A perfect scale yields a rank ordering of cases (individuals, districts, nations, or whatever are the units of analysis) on the basis of their possession of attributes or institutions which are themselves ranged from low to high, or from less to more "extreme" on a presumed underlying continuum. The presumption of unidimensionality derives from the cumulative nature of the arrangement of items. That is, a higher scale score implies not only that the case in question possesses more of the scale items, as well as rarer or more extreme items than cases ranking below it; in addition, it indicates that cases with higher scores possess all the attributes of the cases with lower scores, and one or more in addition. In a perfect scale, as illustrated below, if we know the order of the items, the score alone tells us not only how many are present for a given case, but also exactly which ones. If the score is 2, for instance, it is known that the case possesses only the two lowest, or least extreme, items - in this instance A and B.

Table 1. The Perfect Guttman Scale

	Items						
Cases	A	B	C	D	E	F	Scores
1	1	1	1	1	1	1	6
2	1	1	1	1	1	0	5
3	1	1	1	1	0	0	4
4	1	1	1	0	0	0	3
5	1	1	0	0	0	0	2
6	1	0	0	0	0	0	1
7	0	0	0	0	0	0	0

Scale Error, Reproducibility, and Scalability. The difficulty is that perfect scales are hardly every found in actual practice. There will almost always be some error. The problems of determining the amount of error in a set of data, and using this information to assess the degree to which the data approximate perfect unidimensionality are the ones which have to be dealt with in ordinary practice.

Unfortunately, there is more than one way of arriving at a determination of whether or not a set of items is scalable, depending primarily on how "errors" are counted. The two most common ones are known as the Cornell technique and the Goodenough technique. Whichever technique is used for counting errors however, the coefficients used to assess the degree of approximation to perfect scalability (discussed below) are computed in exactly the same way.

Guttman himself originally proposed the "coefficient of reproducibility" as the criterion of fit to the ideal pattern. This is obtained by diving the number of errors by the total number of responses (cases times items), and subtracting the resulting fraction from 1:

$$\text{Coefficient of reproducibility (C.R.)} = 1 - \frac{\text{Errors}}{\text{Total Responses}}$$

This coefficient represents the proportion of actual responses which could be accurately reproduced if only the item order and the scale scores for each case were known. In a perfect scale, the C.R. will be 1.00. Guttman recommends a .90 as the minimum acceptable value.

Note: This section was prepared by Charles C. Schlegel.

There are a number of problems with C.R., the main one being that if almost all the responses for a given item fall into only one of the categories (present or absent), the maximum possible scale error contributed by that item will be very small, and the overall coefficient may thus be artificially inflated. In fact, the reproducibility of any item can never be lower than the proportion of responses in the smallest category. And since the reproducibility for the whole scale is the simple average of all the item reproducibilities, there is danger of inflating C.R. artificially merely by the inclusion of items with extreme distributions. Therefore, the minimum value of C.R. cannot be .00, even with totally random responses to each item; and when only dichotomous items are used, it cannot be lower than .50.

In order to correct for these deficiencies, Menzel developed another coefficient, called the "coefficient of scalability". The formula for this is:

$$\text{Coefficient of Scalability (C.S.)} = 1 - \frac{\text{Errors}}{\text{Maximum Errors}}$$

where the maximum number of possible errors is defined (for dichotomous data) as the sum of the non-modal (least frequent) responses over all cases, or the sum of non-modals over all items, whichever is smaller. (Note that the number of non-modals for both cases and items is independent of the arrangement of the data. It is simply the number of responses in the minority category.) C.S. can range from .00 to 1.00, and except for perfect scales (where both are 1.00) will always be smaller than C.R. Menzel suggests a minimum acceptable level of .60 to .65. The latter value is now generally employed.

For a given set of data, the denominators in the formulas for both C.R. and C.S. are fixed, but the number of errors (the numerators) is a function of the arrangement of items and cases in the overall pattern. Errors are those responses which are "out of place" with respect to a perfect scale pattern. While there is no disagreement on what constitutes a perfect scale, there is, paradoxically, considerable controversy over just what constitutes a deviation (error) from the ideal pattern. As the different methods of counting errors can result in quite different coefficients, the two most common ones--the Cornell and the Goodenough techniques--deserve some detailed attention.

The Cornell Technique. To begin with, it is necessary to examine more closely the properties of the perfect scale. As the example in Table 1 shows, if columns are arranged from right to left and rows from top to bottom in descending order of the number of positive ("1") responses, the result is a patterned configuration of items and cases such that there are clear and unambiguous boundaries, or cutting points, between the 1's and 0's for every row and simultaneously for every column in the data matrix. Although the cutting points in this example can easily be located by inspection, precisely the same result would be obtained by counting the number of positive responses for each case and placing the cutting point that many positions over from the left-hand margin of the table. Similarly, item cutting points could be located by counting down from the top the same number of positions as there are positive responses for that item. This fact may seem trivial, but its importance in the actual construction of scales from an unordered data matrix will presently become clear.

A set of hypothetical data is given in Table 2. This is simply a data matrix "as it comes", that is, before any attempt has been made to rearrange rows and columns to fit the scalogram pattern. How might we proceed in determining if this data forms a Guttman scale?

Since in the perfect case the arrangement is a simple function of the column and row frequencies, we might begin by arranging the data in Table 2 according to these criteria. Reordering the cases so that the ones with the most frequent positive responses are placed at the top of the matrix, and the items with the most popular ones at the left, we arrive at the pattern shown in Table 2a.

Clearly these data do not form a perfect scale; for items A and F, 1's are scattered among the 0's and 0's among the 1's. The objective of the Cornell technique is to minimize the number of 1's and 0's which are "out of place"--in other words, the number of errors. To do this, we reorder both cases and items until any further reshuffling will not result in additional reduction of error. This is a repetitive process, and if there are many cases and/or items it can be very tedious if done by hand, although the method itself is quite simple. The following step-by-step procedures may prove helpful.

Table 2. Hypothetical Data Matrix

	Items						
Cases	A	B	C	D	E	F	Frequency (by rows)
1	0	0	1	1	0	1	3
2	1	0	1	1	0	0	3
3	0	0	0	1	0	0	1
4	1	1	1	1	1	1	6
5	1	0	0	1	0	0	2
6	0	0	0	1	0	1	2
7	0	0	0	0	0	0	0
8	1	1	1	1	0	0	4
9	1	0	0	1	0	1	3
10	1	1	1	1	1	0	5
Frequency (by columns)	6	3	5	9	2	4	

Table 2a. Data Arranged by Row and Column Frequency

	Items						
Cases	D	A	C	F	B	E	Frequency (by rows)
4	1	1	1	1	1	1	6
10	1	1	1	0	1	1	5
8	1	1	1	0	1	0	4
1	1	0	1	1	0	0	3
2	1	1	1	0	0	0	3
9	1	1	0	1	0	0	3
5	1	1	0	0	0	0	2
6	1	0	0	1	0	0	2
3	1	0	0	0	0	0	1
7	0	0	0	0	0	0	0
Frequency (by columns)	9	6	5	4	3	2	

Steps for Constructing a Scale (Cornell Technique)

1. From the original table or code sheet containing the data coded 0 and 1, construct a new table, arranging the columns of data so that the item with the highest positive frequency is on the left, followed by the remaining items in descending frequency order. Be sure to label rows and columns so you can keep track of them. The ordering among tied items is immaterial.*

2. Make another table, arranging the rows of the table produced in (1) so that the case with the highest positive frequency is on top, the case with the next highest frequency second, etc.

3. Find the cutting points for both cases and items. This is the point between two cells of the table which divides most of the 1's from most of the 0's. Each 1 0 pattern represents a potential cutting point. The one to choose is the one which minimizes the error for that case or item.

   The errors for a given row is determined by the number of 1's to the right of the cutting point plus the number of 0's to the left of it. For columns it is the number of 1's below the cutting point plus the number of 0's above it. Should more than one of the potential cutting points result in the same minimum number of errors, choose the one farthest to the left (in the case of rows) or nearest the top (in the case of columns).

   In a case such as row (a) below, for example, there are three 1 0 response pairs: CD, EF, and HI. There are therefore three possible cutting points. A decision to place the cutting point between C and D would produce three errors, as shown in (b);

	A	B	C	D	E	F	G	H	I
a.	1	1	1	0	1	0	1	1	0
b.	1	1	1 :	0	~~1~~	0	~~1~~	~~1~~	0
c.	1	1	1	~~0~~	1 :	0	~~1~~	~~1~~	0
d.	1	1	1	~~0~~	1	~~0~~	1	1 :	0

   between E and F would also produce three errors (c). Placing the cutting point between H and I, however, yields only two errors (d), and is thus the one to choose.

   If there had been an additional item, J, with a response of 1, the situation would have been slightly different. Potential cutting points in the series A to I remain as before, only now the 1 at the end of the row furnishes another 1 0 pattern (we imagine another column of 0's immediately to the right of J), and thus another possible cutting point.

	A	B	C	D	E	F	G	H	I	J	
e.	1	1	1 :	0	1 :	0	1	1 :	0	1 :	(0)

   Again counting errors, we get four at CD and EF, and three at HI and J-. Following the rule to take the left-most alternative in the case of ties, we pick HI.

   The procedure for establishing cutting points for items is identical except that errors are 0's above the cutting point and 1's below it. It helps to mark the row and column cutting points in preparation for the next step.

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*Actually, varying the order of tied items (or cases) will sometimes produce different numbers of errors. The only fixed rule to follow is the general one of minimizing error. But since the optimal ordering will never be known until all possibilities are tried, the minor differences that are likely to result will not in most cases justify the effort.

4. Using the cutting points rather than the positive frequencies as the guide, repeat steps (1) and (2). That is, the columns should be rearranged (if necessary) so that the one with the longest series of 1's (with the cutting point nearest to the bottom of the column) is at the left of the table, while the one with the shortest series of 1's (with the cutting point nearest the top) is on the right. In still another table, rearrange the rows so that the longest series of 1's are at the top, and the shortest at the bottom.

   Repeat as often as necessary. The optimum arrangement is reached when no case has a cutting point further to the left than any case below it, and no item's cutting point is below that of an item to its left. This is the position at which a further rearrangement of rows or columns will not further reduce the amount of error in the scale.

5. Calculate coefficients of reproducibility and scalability as follows:

   (a) Count the total number of errors in the scale. An error is a 1 in any row which is to the right of the cutting point or a 0 which is to the left of the cutting point. Write the number of errors in each row next to the row, and sum them.

   (b) Count the number of non-modals for each row and column and write them down. The "non-modal" for a row or column is the frequency of responses in the smallest category (either 1's or 0's). If there is an equal number of 1's and 0's in a row or column, the non-modal is simply the frequency in either category.

   Find the total number of non-modals for all rows, and the total for all columns.

   (c) Calculate the total number of responses (both 0's and 1's) in the table by multiplying the number of columns times the number of rows.

   (d) Using the formula $\text{C.R.} = 1 - \frac{\text{errors}}{\text{total responses}}$, compute the coefficient of reproducibility. The minimum acceptable value for a good scale is .90.

   (e) Compute the coefficient of scalability using $\text{C.S.} = 1 - \frac{\text{errors}}{\text{maximum errors}}$, where the maximum possible number of errors in the table is equal to the smallest of the two figures arrived at in (b), i.e., the smallest sum of non-modals. The minimum acceptable value is .65.

6. If C.R. and C.S. meet the minimum requirements, your data may be regarded as scalable, and you can assign scores to each of your cases. The scale score for each case is found by counting the number of positions to the left of the cutting point in each row--including any possible 0's, which are regarded as deviations from the case's "true" scale position.

   We can illustrate these steps using the data shown in Table 2 above.

Step 1. Arrange columns according to their positive frequencies.

Table 3a. Data Arranged by Column Frequency

	Items						
Cases	D	A	C	F	B	E	Frequency (by rows)
1	1	0	1	1	0	0	3
2	1	1	1	0	0	0	3
3	1	0	0	0	0	0	1
4	1	1	1	1	1	1	6
5	1	1	0	0	0	0	2
6	1	0	0	1	0	0	2
7	0	0	0	0	0	0	0
8	1	1	1	0	1	0	4
9	1	1	0	1	0	0	3
10	1	1	1	0	1	1	5
Frequency (by columns)	9	6	5	4	3	2	

Step 2. Rearrange Table 3a according to positive frequencies of rows.

Table 3b. Data Arranged by Row and Column Frequency

	Items						
Cases	D	A	C	F	B	E	Frequency (by rows)
4	1	1	1	$\underline{1}$	1	1 :	6
10	1	1	1	0	1	$\underline{1}$:	5
8	1	1	1 :	0	$\underline{1}$	0	4
1	1	0	1	1 :	0	0	3
2	1	1	$\underline{1}$:	0	0	0	3
9	1	1 :	0	1	0	0	3
5	1	$\underline{1}$:	0	0	0	0	2
6	1 :	0	0	1	0	0	2
3	$\underline{1}$:	0	0	0	0	0	1
7	: 0	0	0	0	0	0	0
Frequency (by columns)	9	6	5	4	3	2	

Step 3. Find the cutting points. These are shown in Table 3b, with a colon (:) indicating cutting points by rows, and underlining showing cutting points by columns. Note that for this example the ordering by cutting points does not correspond exactly with the ordering by positive frequency.

Step 4. Using the cutting points rather than frequencies, repeat Steps 1 and 2.

Table 3c. Data Arranged by Column Cutting Points

	Items						
Cases	D	A	C	B	E	F	Frequency (by rows)
4	1	1	1	1	1	1 :	6
10	1	1	1	1	1 :	0	5
8	1	1	1	1 :	0	0	4
1	1 :	0	1	0	0	1	3
2	1	1	1 :	0	0	0	3
9	1	1 :	0	0	0	1	3
5	1	1 :	0	0	0	0	2
6	1 :	0	0	0	0	1	2
3	1 :	0	0	0	0	0	1
7	: 0	0	0	0	0	0	0
Frequency (by columns)	9	6	5	3	2	4	

Table 3d. Data Arranged by Row Cutting Points

	Items						
Cases	D	A	C	B	E	F	Frequency (by rows)
4	1	1	1	1	1	1	6
10	1	1	1	1	1	0	5
8	1	1	1	1	0	0	4
2	1	1	1	0	0	0	3
9	1	1	0	0	0	1	3
5	1	1	0	0	0	0	2
1	1	0	1	0	0	1	3
6	1	0	0	0	0	1	2
3	1	0	0	0	0	0	1
7	0	0	0	0	0	0	0
Frequency (by columns)	9	6	5	3	2	4	

Table 3d represents the optimal row and column ordering and the connected cutting points exhibit the characteristic stair-step pattern. With some data it is necessary to repeat Steps 3 and 4 more than once.

Step 5. Calculate coefficients and assign scale score.

Table 3e. Completed Scale Showing Errors, Non-Modals, Coefficients, and Scale Scores

Cases	Items D	 A	 C	 B	 E	 F	Frequency (by rows)	Non-Modals (across)	Scores
4	1	1	1	1	1	1	6	0	6
10	1	1	1	1	1	0	5	1	5
8	1	1	1	1	0	0	4	2	4
2	1	1	1	0	0	0	3	3	3
9	1	1	0	0	0	1	3	3	2
5	1	1	0	0	0	0	2	2	2
1	1	0	1	0	0	1	3	3	1
6	1	0	0	0	0	1	2	2	1
3	1	0	0	0	0	0	1	1	1
7	0	0	0	0	0	0	0	0	0
Frequency (by columns)	9	6	5	3	2	4			
Non-Modals (down)	1	4	5	3	2	4			
Errors	0	0	1	0	0	3			

TOTALS: Non-modals down = 19; across = 17; errors = 4

Coefficient of Reproducibility = 1 - (4/(6x10)) = .933

Coefficient of Scalability = 1 - (4/17) = .765

The Goodenough Technique. For some, the Cornell method rests too heavily on the subjective judgement and experience of the analyst, on rules of thumb and arbitrary decisions. They criticize the minimization-of-error criterion, and the data manipulation which it implies, as a type of cheating, in the sense that by way of such manipulation one consciously attempts to improve the odds in favor of a preferred outcome. There is another set of procedures, usually called the Goodenough technique, which is more straightforward in its error counting rules and permits less manipulation of the data.

It will be recalled that in a perfect Guttman scale the cutting points correspond perfectly to the number of positive responses for both items and cases. If the items are ordered from left to right according to their decreasing popularity, all cases having only one positive response will have 1's only in the left-most column, and 0's in all other columns. If two items are present in a given case, they will necessarily be those two which are the "easiest", and therefore the most frequent, and therefore the ones which were placed farthest to the left when the items were ranked by positive frequency. This characteristic becomes the standard according to which cutting points are established, and errors counted, using the Goodenough technique.

Once the items are arranged according to their popularity, no further shuffling is permitted. Cases may be ordered for convenience in detecting patterns of irregularity, but this is unnecessary for determining scale scores. The scores are simply the number of positive responses for each case. Errors are counted according to whether the 1's and 0's for each case conform to the pattern expected from their scores.

Table 4 shows the data matrix after it has been arranged by row and column frequency, and is identical to Table 2b. (As already noted, the rearrangement by row frequency is unnecessary, but it makes error counting easier and facilitates comparison with the Cornell technique.)

Table 4. Final Scale Using Goodenough Technique

	Items								
Cases	D	A	C	F	B	E	Frequency (by rows)	Non-Modals (across)	Scores
4	1	1	1	1	1	1 :	6	0	6
10	1	1	1	0	1 :	1	5	1	5
8	1	1	1	0 :	1	0	4	2	4
1	1	0	1 :	1	0	0	3	3	3
2	1	1	1 :	0	0	0	3	3	3
9	1	1	0 :	1	0	0	3	3	3
5	1	1 :	0	0	0	0	2	2	2
6	1	0 :	0	1	0	0	2	2	2
3	1 :	0	0	0	0	0	1	1	1
7	: 0	0	0	0	0	0	0	0	0
Frequency (by columns)	9	6	5	4	3	2			
Non-Modals (down)	1	4	5	4	3	2			
Errors	0	2	1	5	1	1			

TOTALS: Non-modals down = 19; across = 17; errors = 10

Coefficient of Reproducibility = 1 - (10/(6x10)) = .833

Coefficient of Scalability = 1 - (10/17) = .412

The location of cutting points is very simple. If a case has a score of 4, then 1's should be found in (and only in) the first four positions on the left. These positions correspond in Table 4 with Items D, A, C and F. The cutting point, therefore, lies between Items F and B. Case 8, with a score of 4, has a 0 for Item F which "should be" a 1 (because it is to the left of the cutting point), and a 1 for Item B which "should be" a 0 (because it is to the right of the cutting point). Both of these responses are therefore counted as errors. In general, one error is counted for each position where 1 is absent but "should be" present, and also for each position where it is present but "should be" absent.

Comparing Tables 3e and 4, we see that the number of errors counted according to the Goodenough criteria is considerably larger than the number using the Cornell technique. The coefficients of scalability and reproducibility are accordingly quite different. There are also variations in the ranking of cases, though the differences are rather small. The number of errors in a Cornell scale will ordinarily be smaller than in a Goodenough scale using the same data because with the Cornell technique the explicit objective is to minimize error. Consequently, the minimum values of C.R. and C.S. are easier to achieve.

From this point of view, the Goodenough method clearly provides the more rigorous test of scalability. The Cornell method, on the other hand, would appear to make fuller use of the information contained in the data. The manipulations which the latter's critics call cheating, its supporters call a more thorough search for a pattern that may be embedded in the data.

We cannot resolve the issue here. As with most matters of this kind, the decision must be made by the analyst himself, taking into account the problem at hand, his data, and his personal preference.

Item Elimination. Two separate but related problems which usually arise in scalogram analysis concern the elimination of "unscalable" items and the "best" number of scalable items to retain in the final scale. An example may help to clarify these issues.

In the example shown in Table 5 we have already taken steps 1-3 above. (We are using the Cornell technique.) At this stage, both C.R. and C.S. are slightly below the acceptable

Table 5. Scalogram Showing Items with Low Scalability

	Items														
Cases	A	B	C	D	E	F	G	H	I	J	K	L	M	Non-modals (across)	Scores
1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	13
2	1	1	1	1	1	1	1	1	1	0	1	1	0	2	12
3	1	1	1	1	0	1	0	1	1	1	1	0	0	4	11
4	0	1	1	1	1	1	1	1	1	1	0	0	0	4	10
5	1	1	0	1	1	1	1	1	1	0	0	0	0	5	9
6	1	1	1	1	1	1	0	0	0	0	0	0	0	6	6
7	1	1	1	1	1	1	0	1	0	0	0	0	0	6	6
8	1	1	1	0	0	0	0	0	0	1	0	1	0	5	3
9	1	0	0	1	0	0	1	0	0	0	0	0	0	3	1
10	0	0	1	0	1	0	1	0	0	0	0	0	0	3	0
Errors:	1	0	2	1	2	0	4	1	0	2	0	1	0		
Non-modals (down)	2	2	2	2	3	3	4	4	5	4	3	3	1		
Item C.S.	.50	1.0	0.0	.50	.33	1.0	0.0	.75	1.0	.50	1.0	.67	1.0		

TOTALS: Non-modals down = 38; across = 39; errors = 14

C.R. = .892 C.S. = .632

minimum values. In general, this means that the scale as it stands contains too many errors.

As noted earlier, the smaller total number of non-modals is the factor which determine the maximum possible number of errors in the scale. The number of non-modals for a given item is likewise the largest possible number of errors for that item. We can therefore compute a C.S. for each column and use these coefficients as one criterion for eliminating items which contribute relatively high proportions of the total scale error.

In Table 5, C.S. for each item has been calculated. We see that items C and G each have their maximum possible number of errors, and C.S. for each of them is consequently 0.0. Other items have coefficients of scalability below the minimum value that would be acceptable for the scale as a whole. The question is how many items should be dropped, and which ones. Several factors might be relevant in making this decision.

In the first place, it may well be possible to achieve a satisfactory overall C.S. without dropping all items whose individual C.S.'s are low. Dropping only item G from Table 5, for instance, produces Table 5a. Note that the removal of this item has changed the overall pattern somewhat, so that cases 6 and 7 must now be reversed to restore the characteristic stair-step configuration. When this is done, the new optimal situation is as is shown in 5b. A recalculation of C.R. and C.S. indicate that by eliminating only item G the coefficients have been raised above the minimum values.

Table 5a. Table 5 After Removal of Item G

	Items											
Cases	A	B	C	D	E	F	H	I	J	K	L	M
1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	0	1	1	0
3	1	1	1	1	0	1	1	1	1	1	0	0
4	0	1	1	1	1	1	1	1	1	0	0	0
5	1	1	0	1	1	1	1	1	0	0	0	0
6	1	1	1	1	1	1	0	0	0	0	0	0
7	1	1	1	1	1	1	1	0	0	0	0	0
8	1	1	1	0	0	0	0	0	1	0	1	0
9	1	0	0	1	0	0	0	0	0	0	0	0
10	0	0	1	0	1	0	0	0	0	0	0	0

Whether this is good enough depends upon what is wanted from the scale, and what price one is willing to pay in order to achieve the most nearly perfect pattern.

Had we dropped all items with a C.S. below .65, we would have ended up with the seven-item scale shown in Table 5c. Both scale coefficients in Table 5c are very high. It will be noted, however, that although the scale scores have changed, the ranking of cases has not, except that whereas no ranks were tied in 5b, cases 3 and 4 and cases 9 and 10 are now indistinguishable from one another. By dropping the poorer items we have gained reliability. The high coefficients in 5c indicate that our ability to predict the exact responses for each case if we know only the item order and the scale scores is now nearly perfect. But in part this is necessarily so, for as the number of possible responses decreases, the probability of predicting correct responses, even by chance, increases correspondingly. In other respects there has been a net loss. We have lost the ability to distinguish between cases 3 and 4 and between 9 and 10, and the reduced scale indicates the ordering of fewer items, and thus has less descriptive value than 5b.

Table 5b. Table 5a After Reversal of Cases 6 and 7

Cases	Items												Non-modals (across)	Scores	Ranks
	A	B	C	D	E	F	H	I	J	K	L	M			
1	1	1	1	1	1	1	1	1	1	1	1	1	0	12	1
2	1	1	1	1	1	1	1	1	0	1	1	0	2	11	2
3	1	1	1	1	1	0	1	1	1	1	0	0	3	10	3
4	0	1	1	1	1	1	1	1	1	0	0	0	4	9	4
5	1	1	0	1	1	1	1	1	0	0	0	0	5	8	5
7	1	1	1	1	1	1	1	0	0	0	0	0	5	7	6
6	1	1	1	1	1	1	0	0	0	0	0	0	6	6	7
8	1	1	1	0	0	0	0	0	1	0	1	0	5	3	8
9	1	0	0	1	0	0	0	0	0	0	0	0	2	1	9
10	0	0	1	0	1	0	0	0	0	0	0	0	2	0	10
Errors:	1	0	2	1	2	0	0	0	2	0	1	0			
Non-modals (down)	2	2	2	2	3	3	4	5	4	3	3	1			
Item C.S.	.50	1.0	0.0	.50	.33	1.0	1.0	1.0	.50	1.0	.67	1.0			

TOTALS: Non-modals down = 34; across = 34; errors = 9

C.R. = .925 C.S. = .735

Table 5c. Scale After Dropping All Items with C.S. Below .65

Cases	Items B	E	H	I	K	L	M	Non-modals (across)	Scores	Ranks
1	1	1	1	1	1	1	1	0	7	1
2	1	1	1	1	1	1	0	1	6	2
3	1	1	1	1	1	0	0	2	5	3.5
4	1	1	1	1	1	0	0	2	5	3.5
5	1	1	1	1	0	0	0	3	4	5
7	1	1	1	0	0	0	0	3	3	6
6	1	1	0	0	0	0	0	2	2	7
8	1	0	0	0	0	1	0	2	1	8
9	0	0	0	0	0	0	0	0	0	9.5
10	0	0	0	0	0	0	0	0	0	9.5
Errors:	0	0	0	0	0	1	0			
Non-Modals (down)	2	3	4	5	4	3	1			
Item C.S.	1.0	1.0	1.0	1.0	1.0	.67	1.0			

TOTALS: Non-modals down = 22; across = 15; errors = 1

C.R. = .986   C.S. = .933

The foregoing reduces to the single question of whether an item with low scalability actually "belongs" in the scale. Unfortunately, as the discussion has suggested, there are no absolute criteria for answering the question either yes or no. In the end, the decision will probably depend primarily on the relative importance, for the particular job at hand, of the content of the scale as against the scale itself as a numerical measure of some variable or dimension.

Quite often more than one item will discriminate the same cases in a scale. These scale equivalents are useless for ranking cases on the scaled variable, but, other things being equal, it generally makes little difference whether they are dropped or retained. An argument for the retention of equivalents is that, from a purely technical point of view there is little basis for deciding which of an equivalent set to keep and which to eliminate.

There are times, however, when equivalent items are somewhat more problematic. As we have already noted, the Guttman scaling technique produces only an ordinal ranking of scale scores. This means that one cannot say that the interval between, say, scores of 5 and 6 is equal to the interval between scores of 10 and 11. And since the equal-interval property is one of the assumptions underlying many common statistical operations, such operations are not, strictly speaking, appropriate for ordinal-level data.

Nevertheless, it is sometimes possible to assume that the ordinal scale approximates interval-level measurement, and to use parametric techniques to determine correlations or other statistical relationships. Special consideration should be given in such cases to the question of whether to include equivalent items. This is because the distances between scores, now assumed to represent meaningful distances on an interval scale, can be changed quite arbitrarily merely by including or excluding equivalent items. Table 5 above, for instance, includes three sets of equivalents: items B and C, items D, E, and F, and items G, H, and I. The interval between the highest score (13) and the lowest (0) is 13 "scale units", if we assume interval measurement. If we were to drop all but one of the items in each equivalent group, however, case 1 would have a score of 8, case 10 would still have a score of 0, but the interval between the two cases would have been reduced from 13 to 8 "scale units". Intervals between most other pairs of scores would have changed also, only not necessarily by equal, or even proportional, amounts. The rank order of cases, on the other hand, remains unaffected.

Since parametric statistics are sensitive to scale distances, whether or not equivalent items are included will affect the relationship between the Guttman scale and other variables, as measured by these statistics. This being so, it may be advisable to exclude equivalents if parametric methods of analysis are to be used.

It goes without saying that this brief paper cannot claim to have covered all the relevant and important issues relating to scalogram analysis. We have taken what is known as the "cookbook" or "how to" approach, concentrating on practical and mundane matters and largely neglecting theoretical and technical questions such as significance tests, interitem correlations, etc. The exclusion of these issues is not to minimize their importance; it is merely to recognize the limits of the writer's competence and the need to keep the discussion within reasonable bounds. Treatment of the more complex issues is to be found in the readings listed at the end of this section.

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FOOTNOTES

1. For bibliography of the social indicators movement see Leslie D. Wilcox, Ralph M. Brooks, George M. Beal and Gerald E. Klonglan, "Social Indicators and Societal Monitoring: An Annotated Bibliography," Amsterdam, Elsevier Publishing Co., 1972, or for a shorter list A.I.D. Bibliography Series: Technical Assistance Methodology No. 2, "Social Indicators," Agency for International Development, Department of State, 1972.

2. For a detailed description of how to conduct such a study see "Manual on Household Food Consumption Surveys," Food and Agriculture Organization of the United Nations, Rome, 1962. Agricultural economists also use the household food budget for this purpose and this is described in Simmons, Emmy Bartz, and Poleman, Thomas T. (1974).

3. For a description of several such studies see Young, F.W. and Young, R.C. (1973), pages 51-52.

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